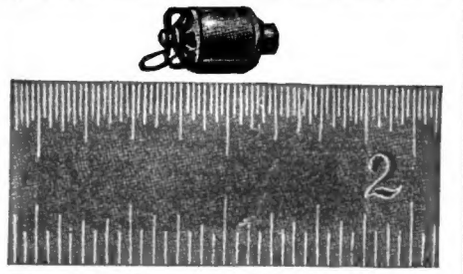
# $200 Miniature Electric Prize Contest

THIS prize contest conducted by PRACTICAL ELECTRICS magazine, promises to be one of the most interesting that has been staged in recent years.

Here at last is something worth while. Not only can you win an attractive prize, but you will derive a tremendous amount of personal satisfaction from this contest. The illustration on this page shows the smallest electrical motor that has been built. Its dimensions are as follows: 11/64" high; 19/64" long. It weighs 5.5 grains.

This little motor is along the lines of our new contest except that we will not be quite so hard on the participants. *We require miniature electric models, the largest dimensions of which must not be more than ¾".* Any electrical appliance, any electrical apparatus, any radio instrument that will be reproduced *in a working condition* in miniature, is eligible for entry in this contest.

**World's Smallest Electric Motor**



Total weight slightly above 5 grains. The tiny armature, .09" in diameter, has 4 pole pieces and is wound with No. 40 silk copper wire. Silver brushes are used. The over-all dimensions of the motor measure 19-64" long and 11-64" high. When connected to a small flash light battery, the motor runs at a very high speed.

## $200 IN GOLD

| | |
|---|---|
| First Prize | $75 |
| Second Prize | 50 |
| Third Prize | 20 |
| Fourth Prize | 20 |
| Fifth Prize | 10 |
| Sixth Prize | 10 |
| Seventh Prize | 5 |
| Eighth Prize | 5 |
| Ninth Prize | 5 |

The judges will welcome miniature models of the following: Electric bells, switches, all kinds of electric heating appliances, electric generators, telephones, microphones, telephone desk stands, telegraph instruments, any and all radio apparatus, static machines, electric lamps, batteries, rheostats, measuring instruments, fans, transformers, in fact any electrical apparatus or electrical appliance. *One of the rules of the contest is that the miniature models must work.* Dummies cannot be entered in this contest. The builders of these miniature models will come in for a goodly share of publicity as many newspapers and periodicals will feature these models.

Full particulars, for entering the miniature models in this contest, closing date, rules and restrictions, etc., will be found in full in the January issue of PRACTICAL ELECTRICS.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Also Editor of
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PRACTICAL ELECTRICS is probably the most novel magazine of its kind ever conceived. It is personally edited by H. Gernsback, editor of SCIENCE & INVENTION and RADIO NEWS. Mr. Gernsback, who founded the old "Modern Electrics" as well as the "Electrical Experimenter," knows thoroughly what his readers want and have wanted for many years. PRACTICAL ELECTRICS, the 100% electrical magazine eclipses the best that was in "Modern Electrics" and "Electrical Experimenter."

Electricity covers such a tremendous field that the man who does not keep abreast with it does himself a great injustice. PRACTICAL ELECTRICS covers that field from every angle. It is written in plain every-day language that all can understand. It portrays the entire electrical development of the month faithfully in non-technical language. It caters to everyone interested in electricity, be he a layman, an experimenter, an electrician or an engineer—each will find in this magazine a department for himself and plenty more.

The January issue now on the news-stands contains 64 pages, over 100 different articles and over 150 illustrations, with an artistic cover in three colors. Professor T. O'Conor Sloane, Ph.D., is associate editor of the magazine.

INTERESTING ARTICLES IN JANUARY "PRACTICAL ELECTRICS"
The Wonders of Radium
Measuring Celestial Temperatures
Aerial Railroad, by Raymond F. Yates.
Analogies and Others, by T. O'Conor Sloane, Ph.D.
Electric Timing of Horse Races, by Jacques Boyer, Paris Correspondent
Commercial Applications of Photoelectric Cells, by Raymond B. Wailes.
German Electric Forges, by Dr. Albert Neuburger.
Book Condenser, by Sherman Hafley
Mount for Transmitter Button, by Robert Rollins
Simple Galvanometer, by Arnold Davidson
Watch Hair Spring Relay, by H. P. Clay

**PRIZES**

This magazine offers a number of prizes, as follows:
Our $50.00 Prize Contest for Junior Electricians and Electrical Experimenters includes as its elements simplicity, as great a degree of novelty as possible, and practicability.
A new contest offering $200 in prizes for best miniature working models of electrical apparatus.
Also a new prize contest giving four prizes amounting to $37.50 for the best account of an odd electrical experience.
$3.00 for the best article on Elec-Tricks, the new department.
$3.00 for the best "short-circuit," the semi-humorous department.
In addition to this, the magazine pays high prices for all electrical experiments, electrical articles, etc. See current issue for full details.

This issue also contains articles by some of the greatest electrical writers, workers and students. The magazine will prove a revelation to any one interested in electricity.

Every issue besides its many other features contains the following departments:

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Vol. XI.
Whole No. 130

# Science and Invention

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Hillsboro, Tex.

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Smackouer, Ark.

**Satisfied With Results**

"I am satisfied with results. Lots of hair is growing where I was bald. I mean in front where one mostly loses hair first. It was just as bare as the palms of my hands. Now hair is coming again."
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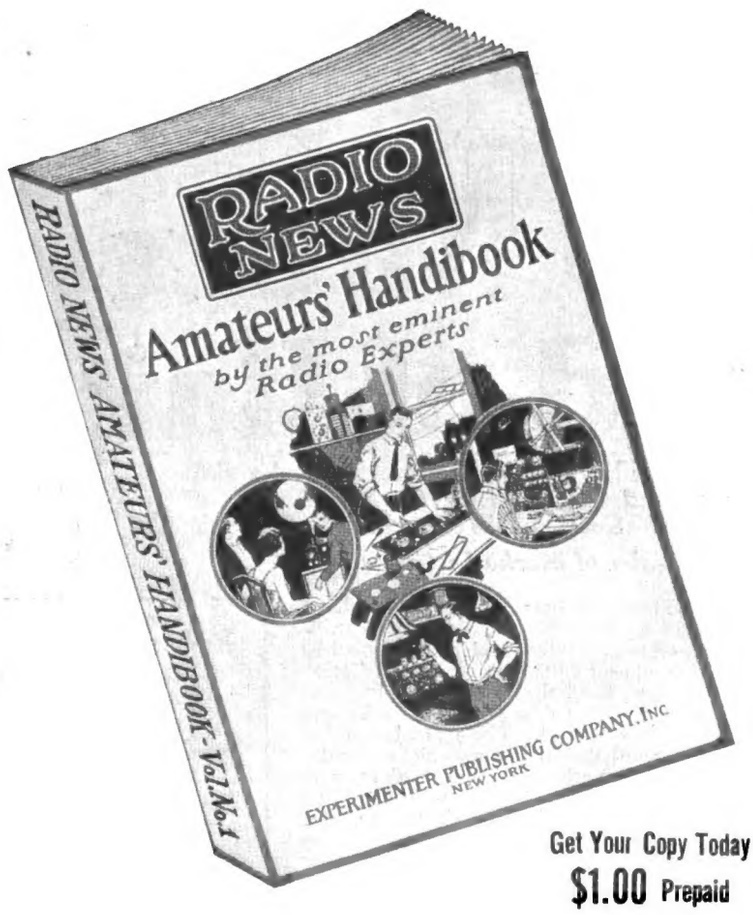


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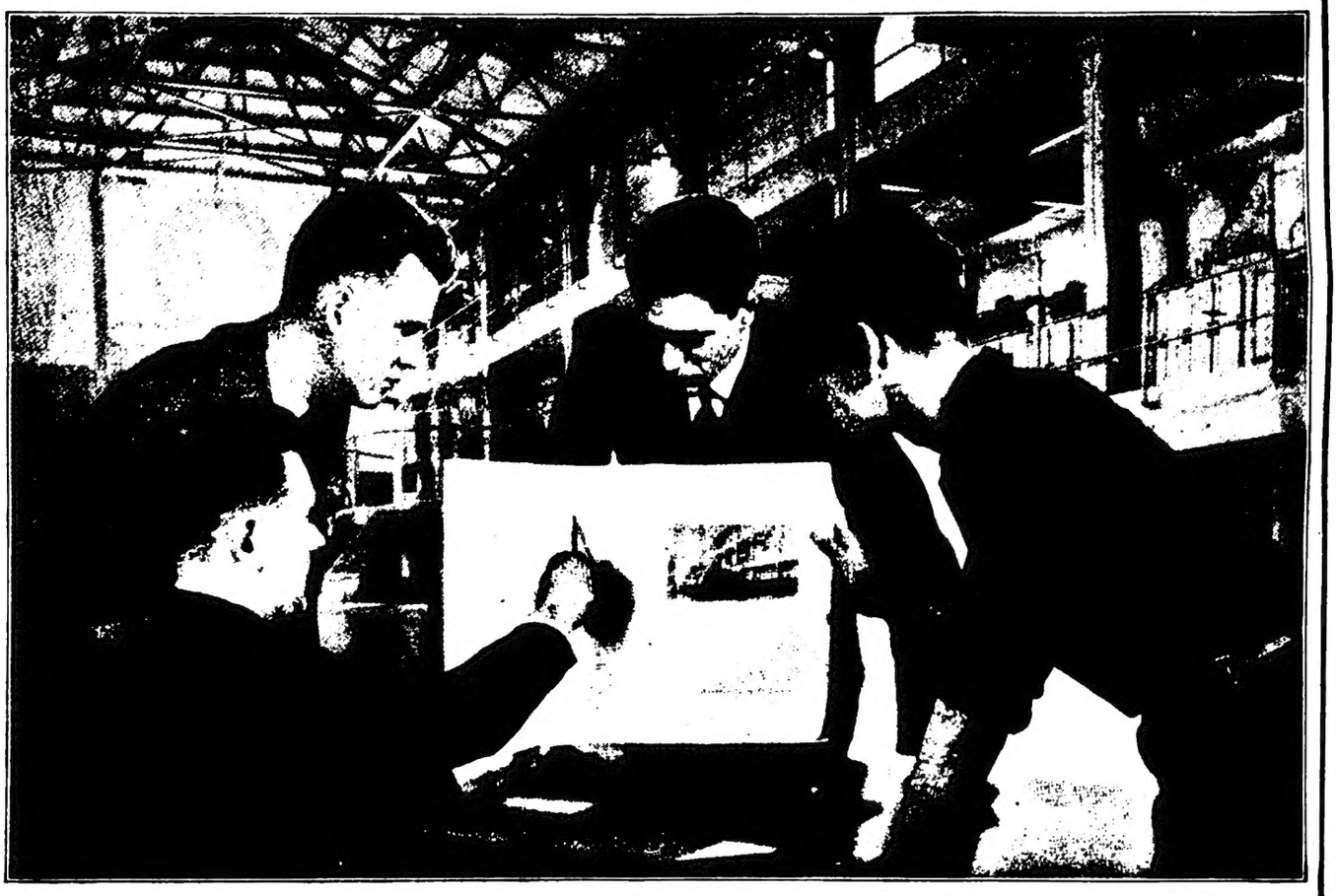

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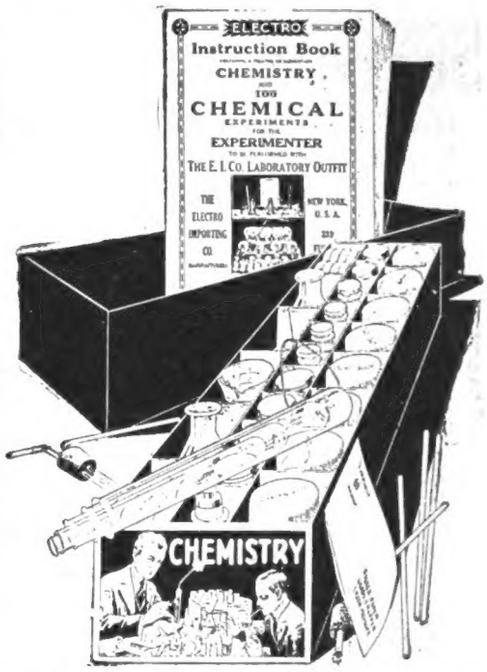


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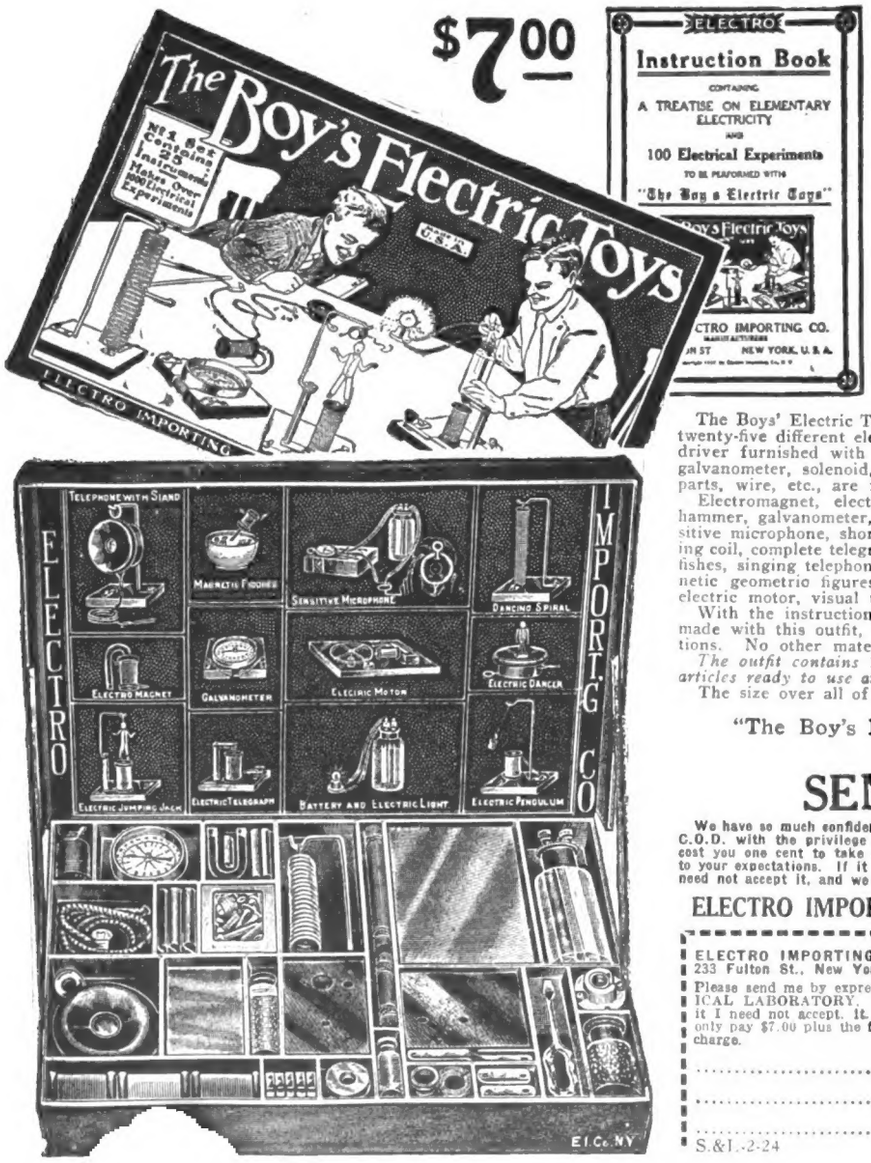


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# Great Inventors Now Teach You Secrets of Practical Invention

**How would *you* like to be the inventor of the tin cap that now corks millions of bottles—and who gets a royalty on every one? How much money would *you* have now if you had invented the simple idea of putting a rubber tip on pencils? The inventor of the Gillette Safety Razor is said to have made as high as $2,500,000 *a year!* The inventor of the tiny snap fastener last year paid an *income tax* of $29,000. The man who invented the Autographic Kodak sold his patent rights for $500,000!**

JUST a single idea can make *you* independently wealthy in a short time. Little things—like the crimped hairpin, the paper safety-match, the metal-tip shoelace—brought their inventors hundreds of thousands of dollars. Only recently *Success Magazine* told how one woman built up a splendid business from an invention based on a little wedge-shaped piece of wood!

Couldn't *you* develop an invention as simple as these? Haven't *you* some ideas—even now—for one of these little inventions which can pay you so much money?

## What Invention Is

After all, invention is nothing more than the science of "fixing things." And how many times a day you do "fix things." A leaky faucet, a rattling window, a broken strap—you fix hundreds of things just like these almost every day. You may not know it, but when you "fix things" you are using the principles upon which Inventive Science is based.

Prove it for yourself. Here is shown a very simple problem in invention. See how quickly you can solve it. What would you put on Shaft "A" to force members "BB" to move back? Think of something you know now which can give you the answer. If you have an ordinary electric light switch you will find it in a second.

Invention is not guesswork or blind luck—it is not a God-given faculty possessed by a few favored mortals. The truth is that invention is based upon exact laws which anyone can learn. It is merely a matter of first *seeing* something to be fixed and then of *thinking* of some principle which will fix it. Thats all. The whole thing rests on being able to think inventively. The simple problem shown here proves that when you think inventively the whole science of invention becomes as easy to learn as reading or writing.

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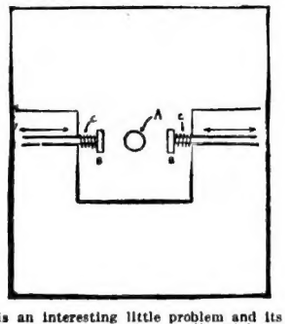

Here is an interesting little problem and its solution will be found very simple, if we really think hard. "A" is the end of a shaft. The two members "B B" are free to move in either direction indicated by the arrows. If they are pushed back, the springs "C C" will immediately pull them forward again. Our problem is to put some kind of an attachment on the revolving shaft "A" so that the members "B B" will be pushed back both at the same instant every time the shaft "A" makes a single revolution. The device on shaft "A" must also allow the two members "B B" to come forward once in every revolution. What would you suggest putting on the shaft "A"?

## Why More Inventions Are Needed Now

Hundreds of years ago, the world didn't need many new things. That is why few inventions were made each year. But now the world has more needs, more things to be "fixed." And that is why, in the United States alone, over 50,000 inventions are patented every year!

The world wants better and cheaper light and power. It wants an electric light that will be heatless. It wants new motors that will weigh less and produce more power. It wants faster and less costly aeroplanes, motor cars, steam engines. It wants new inventions which will make cooking and housework easier; that will save time and labor in the home, the farm, the factory and the office. It wants new ideas for toys and other amusements. It wants its present inventions to be developed so that they will work better and more economically.

Surely you have at least one idea for an invention—no matter what it is—no matter how great or how small—the world will pay handsomely for even the simplest idea. Every day you see things which can be improved or which must be "fixed." Every day you can get ideas for new inventions. It can be a new kind of mechanical toy, or some device which will make your wife's housework easier. It can even be something as simple as the common nutcracker. The man who invented the Kiddie-Kar, it is reported, made over $5,000,000!

## What Edison Says

Could you ask the advice of any greater authority than Thomas A. Edison? He says: "INVENTION IS A SCIENCE AND SHOULD BE TAUGHT AS A PROFESSION."

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Today fifteen famous inventors tell you WHAT TO INVENT and HOW TO INVENT. They tell you the secrets of invention which every successful inventor knows. They explain how to originate ideas, how to develop and perfect them, how to get patents. But they tell you even more: Thousands of inexperienced inventors have been defrauded of their rewards because they did not know how to protect their patent rights. This great course tells you everything you want to know—how to sell your invention, how to get royalties—how to get the most money for your ideas.

*Raymond C. Yates, who with fourteen other famous inventors now makes it easy for you to learn how to invent in your spare time at home.*

*Little inventions like these have brought fortunes to their inventors*

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Volume XI
Whole No. 130

# Science and Invention

H. GERNSBACK, EDITOR AND PUBLISHER
H. WINFIELD SECOR, ASSOCIATE EDITOR
T. O'CONOR SLOANE, Ph.D., ASSOCIATE EDITOR

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FEBRUARY
1924
No. 10

***"Those Who Refuse to Go Beyond Fact Rarely Get As Far As Fact"--HUXLEY***

# Sleep

## By H. GERNSBACK

THERE are few subjects that are understood as little as sleep. Most of us go to sleep every night, as a matter of fact, but how many people really know why we sleep, what the functions of sleep are, and what occurs in our brain when we do sleep. Strange to say, the subject, fascinating as it is, is one of the great unexplored spheres of knowledge. There are few books in existence today treating on sleep and every encyclopedia you come across will give a different theory. Summing it up, it would seem that we really know nothing about it at all and that one man's theory is as good as that of the next. Some investigators believe that sleep is due to a gradual accumulation of poisons in the body, a sort of auto-intoxication that finally benumbs our brain, thus putting us to sleep; a plausible theory, which, however, has been disproved as not being founded upon fact. Another theory is that the brain simply tires—just as our muscles become fatigued—and upon relaxing, a sort of suspended animation sets in, thus producing the condition of sleep.

**I BELIEVE**
**¶ THAT many a fact often turns out to be only a near fact.**

There are different kinds of sleep which might be classified as follows:

1—Natural sleep. 2—Hypnotic sleep. This particular sleep is distinguished from all other varieties by the fact that the subject under hypnosis can sleep with his eyes open. 3—Narcotic sleep produced by drugs. This sleep, similar to the hypnotic sleep, is very sound and much deeper than natural sleep. 4—Sleep produced by blows or by fainting. Also called unconsciousness. 5—Hibernating sleep found in many animals such as bears, etc. This is probably a true hypnotic sleep. During such sleep the animal suspends practically all animation. The heart action, as well as the action of the respiratory organs are greatly decreased. The hibernating sleep is by no means found only in animals, but in human beings as well. The East Indian, particularly, can produce the hibernating sleep. During such sleep the tongue is usually rolled back into the mouth and the subject's body becomes more or less stiff as in a cataleptic stage. Many East Indian performers can thus sleep for weeks at a time without taking any nourishment whatsoever and rising from the long sleep unharmed.

**I BELIEVE**
**¶ THAT ideas of a feather flock together.**

A tremendous amount of research work will have to be done before we really know what happens when we fall asleep. In the meanwhile, the writer ventures a few remarks on the subject which may or may not be disproved in the future.

In the first place, sleep is a habit like many other habits, inbred and inborn in us since prehistoric times. When our ancestors had as yet not reached the human stage, all animation ceased with sun-down, as is the case with most animals today. It appeared dangerous to prowl around during the darkness. After sunset the animal sought its lair or cave and gradually its movements became less until the animal finally stretched out and relaxed. There being no light, the eyes shut tight and soon a total relaxation set in. This is the case today with nearly all animals, including the human race as well. It should be noted here, and the writer lays particular stress upon it, that there seems to be a relation between the optic nerve and the sleep producing causes, for *as long as you keep your eyes open you do not sleep*, except hypnotically. This is the case with nearly all animals, with few exceptions. Fish, on the other hand, which do not close their eyes, do not as a rule sleep, with some few exceptions. If you have gold fish in your home you know that they do not relax nor sleep. They keep on swimming ceaselessly. Evidently, they can get along without sleep.

We also know by experience that when we are lying in bed and trying to ward off sleep, one of the best ways to do so is to open the eyes. This would seem to disprove completely the auto-intoxication or poison theory. The writer ventures to say that sleep itself is not absolutely necessary as long as the physical exertions are kept down to a minimum. It is possible that future generations will be able to get along without sleep at all.

**I BELIEVE**
**¶ THAT the quest of knowledge is man's greatest and most exciting sport.**

Indeed, while we are asleep, the brain itself is not asleep, as might be thought. It still has to take care of all the various functions of the body such as respiration, circulation of the blood and dozens of others. In other words, the brain itself never sleeps. The writer has proven this in connection with his hypno-bioscope, now used commercially to teach things to subjects while sound asleep.

Summing up, the writer is of the opinion that sleep is a partial hypnotic effect produced by a slight self-hypnosis. In other words, in order to sleep *you must will to sleep*, either consciously or subconsciously. You can fight off sleep merely by mental exertion as everyone knows and it is thus possible to stay awake for many hours. But the instant you have the actual will or desire to sleep, relaxation sets in, while a slight hypnotic state begins which wears off as the night wanes until the room in which you sleep becomes light. Finally, if the sun shines, yo will wake up automatically in most cases. A partial proof of this theory would be that you can wake yourself up at a pre-determined hour. For instance: You say to yourself before going to sleep that you will wake up at 5:30 in the morning, and you will unfailingly do so if you simply will it strongly enough. This would prove in part the self-hypnotic theory in natural sleep.

It should be understood that the above theory relates only to *normal-natural* sleep. By this is meant the sleep that comes to us under normal, every day conditions. We might call an *abnormal*-natural sleep, the sleep produced through physical exhaustion. For instance, after taking abnormal exercise for an extended period, we find that we readily fall asleep. While this form of sleep still falls under the normal classification it should be noted that the self-hypnotic influence is not nearly so great in this case as in normal-natural sleep. Of course even when we are exhausted physically we still can keep awake if we will it strong enough, but the effort to stay awake becomes tremendous. In this case it is really the muscular-exertion-reflex that unconsciously forces the min to will the sleep and we then fall asleep almost automatically.

To prove that we can get along without sleep, in case of necessity we can go for two, three and sometimes four days without any.

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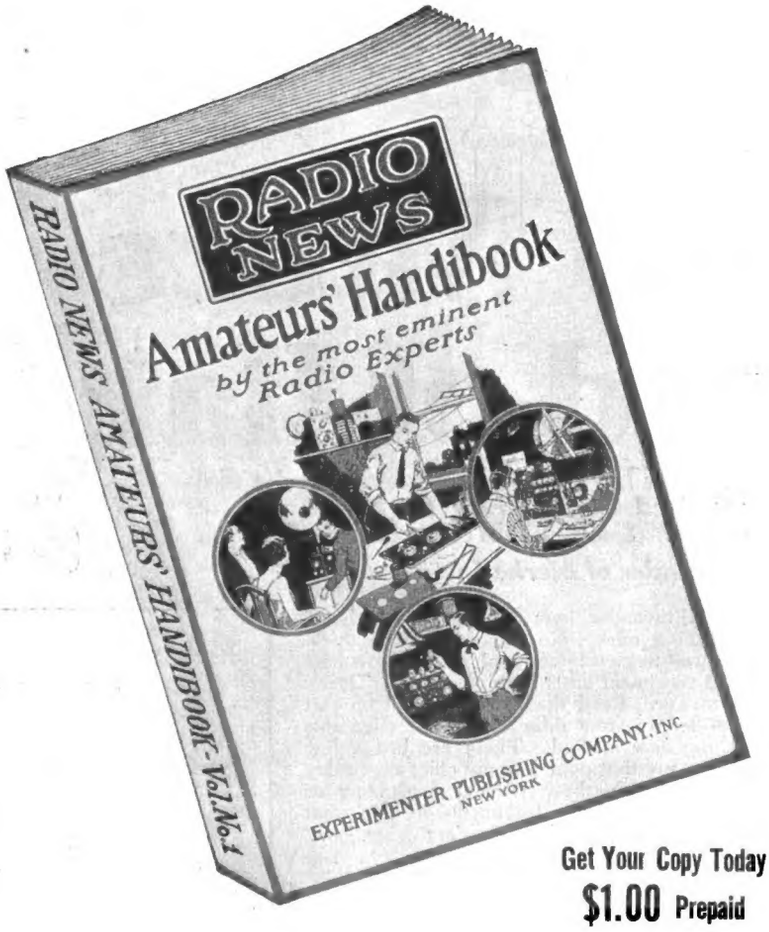


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# Radio Town Crier

By H. Gernsback.

THE accompanying illustration shows a gigantic radio loud-speaker which probably will be known in the future as the Municipal Announcer. Experiments made for the past few years have shown that it is possible to so amplify the human voice, by means of huge horns and vacuum tubes, that it will be heard over a radius of from three to five miles so that each and every word will be understood clearly. In our Electrical Experimenter of November, 1919 issue, there was illustrated how huge horns placed in a church tower projected sound four to five miles.

The idea of the Municipal Loud Speaker is as follows: Huge sky-scrapers, as shown in the illustration, would be equipped with a number of concrete or non-vibrating metallic horns, pointing downward as shown. In this position, the sounds will be dispersed towards the street and buildings, and will also prevent rain and snow entering the horn itself. In cities like New York and Chicago, such horns would be erected every one or two miles. It goes without saying that present buildings can be equipped with such horns, but in the future probably a new sort of architecture will be evolved to take care of them.

The purpose of these Municipal Announcers will be simple. Any news, either of civic or national importance, can be broadcast so that the whole city can hear every word. By opening your office or home window, it will be possible to listen to every word spoken. Thus a Presidential speech, a talk by the Mayor of the city, or any other important feature can be **instantly** transmitted to the entire populace.

For police work, such a device will be of tremendous importance. Suppose a robbery or a murder is committed; the police headquarters can immediately broadcast this news so that every citizen in the neighborhood will be on the look-out for a certain car and will have a description of the law-breaker. The important part is that the information will be instantaneous, which in the detection of crime, is of utmost importance.

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# Science Takes Hand In Beauty

## Appeal to Another Sense Makes Scene More Beautiful.

AT THE THEATRE

In order to increase the reality, and thereby the beauty and effectiveness of a song setting, Hassard Short, in staging the "Music Box Revue" hit upon the simple expedient of appealing to another of the senses. Ordinarily, on the stage, beauty is gained by appealing to the eye and ear. Here science has gone a step further and not only these two organs are appealed to, but the nose is added to the list. The scene is laid in an orange grove of California (above). Shortly after the characters appear and begin the song a gentle scent floats up over the audience, the magic scent of oranges. Then the lights are dimmed and the oranges on the trees begin to glow and the scent becomes stronger until at the end of the scene it pervades the whole theatre. The trick is simply done. In the basement there is a large carburetor-like machine, consisting of a large, flat pan containing a synthetic scent—the nature of which the producers refuse to give since it is not patentable—and a centrifugal blower which draws a draft of warm air over the scent. (Insert) This scent impregnated air is forced up through the ventilation pipes to the vents beneath the seats in the theatre. The oranges on the trees, in the crates and in the wagon all house small lights (3,000 are used in the scene) lit at the proper instant.

An even more gorgeous effect is achieved in another scene in the same production with the aid of lights on costumes using complimentary colors. Directly above are seen the figures as they first appear. The body of the costume is an iridescent purple while the trimmings are a pale yellow. The hangings behind the scene follow the same plan. The foot board which rises to the rear of the stage is black, covered with what seems to be sparkling jewels. Then . . . . There is a sudden change in the lights—so sudden that it is imperceptible until it has happened. The audience gives a little gasp. The costumes have become checked in gold and purple. Even the hats have become checked. The song continues and the background follows the design of the costumes (above). through all the changes in costume color there is not the slightest change in the flesh tints of the cast in spite of the changing colors. Then again . . . In the finale (above) the costumes take on other hues with the repetition of the almost unnoticed light change. They become light maroon and gold checked while the trimmings shine out with a tint all their own. The lights that cause the change are all passed through colored gelatine screens.

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# Great Inventors Now Teach You Secrets of Practical Invention

**How would *you* like to be the inventor of the tin cap that now corks millions of bottles—and who gets a royalty on every one? How much money would *you* have now if you had invented the simple idea of putting a rubber tip on pencils? The inventor of the Gillette Safety Razor is said to have made as high as $2,500,000 *a year!* The inventor of the tiny snap fastener last year paid an *income tax* of $29,000. The man who invented the Autographic Kodak sold his patent rights for $500,000!**

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Couldn't *you* develop an invention as simple as these? Haven't *you* some ideas—even now—for one of these little inventions which can pay you so much money?

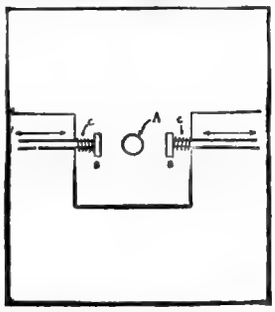
## What Invention Is

After all, invention is nothing more than the science of "fixing things." And how many times a day you do "fix things." A leaky faucet, a rattling window, a broken strap—you fix hundreds of things just like these almost every day. You may not know it, but when you "fix things" you are using the principles upon which Inventive Science is based.

Prove it for yourself. Here is shown a very simple problem in invention. See how quickly you can solve it. What would you put on Shaft "A" to force members "BB" to move back? Think of something you know now which can give you the answer. If you have an ordinary electric light switch you will find it in a second.

Invention is not guesswork or blind luck—it is not a God-given faculty possessed by a few favored mortals. The truth is that invention is based upon exact laws which anyone can learn. It is merely a matter of first *seeing* something to be fixed and then of *thinking* of some principle which will fix it. Thats all. The whole thing rests on being able to think inventively. The simple problem shown here proves that when you think inventively the whole science of invention becomes as easy to learn as reading or writing.

**This test shows how easily you can develop your ability to invent.**



Here is an interesting little problem and its solution will be found very simple, if we really think hard. "A" is the end of a shaft. The two members "B B" are free to move in either direction indicated by the arrows. If they are pushed back, the springs "C C" will immediately pull them forward again. Our problem is to put some kind of an attachment on the revolving shaft "A" so that the members "B B" will be pushed back both at the same instant every time the shaft "A" makes a single revolution. The device on shaft "A" must also allow the two members "B B" to come forward once in every revolution. What would you suggest putting on the shaft "A"?

## Why More Inventions Are Needed Now

Hundreds of years ago, the world didn't need many new things. That is why few inventions were made each year. But now the world has more needs, more things to be "fixed." And that is why, in the United States alone, over 50,000 inventions are patented every year!

The world wants better and cheaper light and power. It wants an electric light that will be heatless. It wants new motors that will weigh less and produce more power. It wants faster and less costly aeroplanes, motor cars, steam engines. It wants new inventions which will make cooking and housework easier; that will save time and labor in the home, the farm, the factory and the office. It wants new ideas for toys and other amusements. It wants its present inventions to be developed so that they will work better and more economically.

Surely you have at least one idea for an invention—no matter what it is—no matter how great or how small—the world will pay handsomely for even the simplest idea. Every day you see things which can be improved or which must be "fixed." Every day you can get ideas for new inventions. It can be a new kind of mechanical toy, or some device which will make your wife's housework easier. It can even be something as simple as the common nutcracker. The man who invented the Kiddie-Kar, it is reported, made over $5,000,000!

## What Edison Says

Could you ask the advice of any greater authority than Thomas A. Edison? He says: "INVENTION IS A SCIENCE AND SHOULD BE TAUGHT AS A PROFESSION."

And now, for the first time, you can profit by Edison's advice. You can actually learn invention as a profession—exactly as other people are learning electricity, automobile mechanics, law, medicine, as a profession. The Bureau of Inventive Science offers you the first course in practical invention ever devised, it has written down the easy-to-learn principles of Inventive Science so everybody could read them and learn to use them. You want the ability to invent—NOW. All you need, to become successful is this easy, fascinating training which will develop your ability so it will be worth real money.

## Learn Invention by Actual Practice at Home

Hitherto inventors had to work out the principles of invention alone. But at what a terrific price in long years of discouragement, lost time, wasted money! Now you can quickly learn, in your spare time at home, the secrets of invention which brought wealth and fame to Edison, Marconi and other great inventors.

Today fifteen famous inventors tell you WHAT TO INVENT and HOW TO INVENT. They tell you the secrets of invention which every successful inventor knows. They explain how to originate ideas, how to develop and perfect them, how to get patents. But they tell you even more: Thousands of inexperienced inventors have been defrauded of their rewards because they did not know how to protect their patent rights. This great course tells you everything you want to know—how to sell your invention, how to get royalties—how to get the most money for your ideas.

*Raymond C. Yates, who with fourteen other famous inventors now makes it easy for you to learn how to invent in your spare time at home.*

## New FREE Book

The most fascinating part of this great new course is that it teaches invention by actual practice, right in your own home. With each lesson you are sent some problem in invention—just like the one you worked out here. This fascinating exercise in solving actual problems in invention, sharpens your instinct to fix things. Better than anything else, it gives you an unforgetable, instinctive habit of thinking inventively, which is worth more than you realize. In fact the lessons and exercises are so simple, so easy to understand, so interesting, that they seem more like a pleasant game than like instruction which can make you a successful inventor.

A wonderful new book, just printed, tells you more about the Bureau of Inventive Science and its simple new course in invention. It explains in detail just how this course develops your ability to invent. It tells you how great inventors work, how to develop your ideas, how to get a patent, how to protect your invention, the best way to sell your invention, how to convert a simple little idea into big money, how to learn all the secrets of successful invention. It costs nothing, so send the coupon at once. This bureau is not connected with patent attorneys or manufacturers. Its only purpose is to teach you the principles of practical invention used by every successful inventor. Write for the FREE BOOK now.

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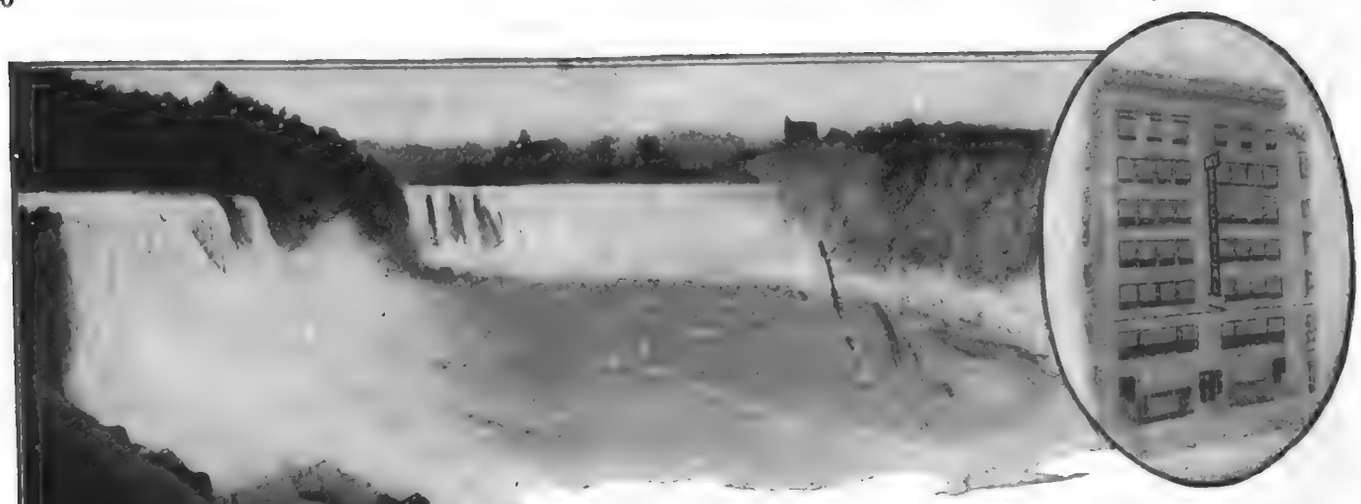

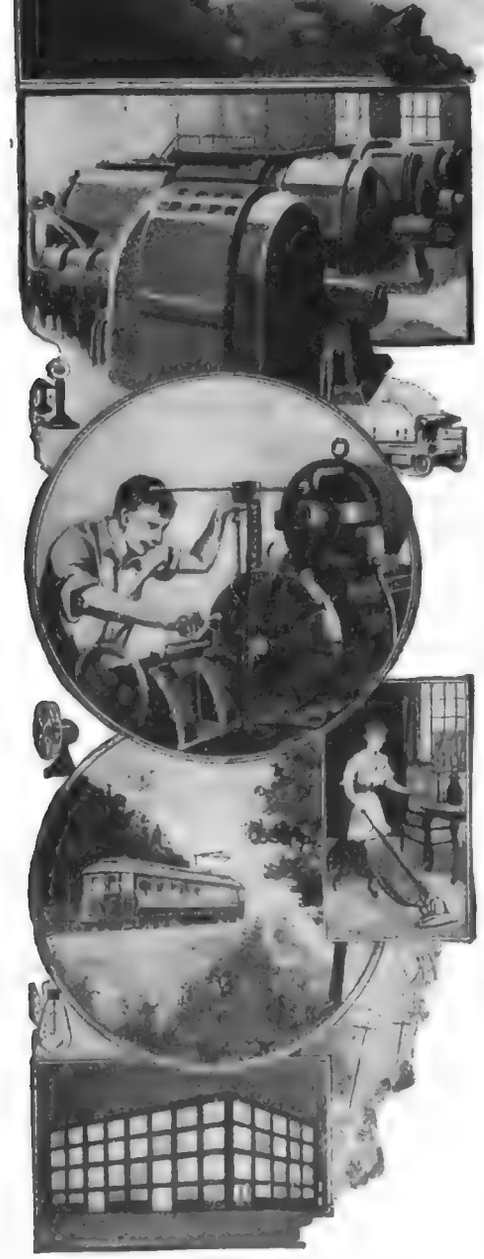

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# New York Electrical School

**29 West 17th Street, New York**

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# An Amphibian Beast of Prey

In battle the machine would be a veritable infernal machine. As is illustrated below, a naval battle in which it would engage would be prepared for somewhat as follows: Floating at the surface of the water, airplanes would be sent out from the deck in a trip of reconnaissance. Plans completed, they would return and the boat would be cleared for action. The anti-aircraft guns would be trained to wait for the approach of the enemy. Submarines would be launched from the two apertures of the vessel, the giant depth bombs would be set in place ready for use to war on enemy submarines. It is noted here that in the hull of the vessel there are sensitive microphones and in each of its family of subs there is a small transmitter that sends out a certain signal familiar to the bombers.

When she had conquered the enemy's sea defense the Captain would merely give orders to proceed to their nearest land fortification. As the vessel approached the shore the tractor treads would be let down and the vessel (or vessels) would proceed to the business of demolishing the fortresses and land forces. The depth bomb and submarine ports would be closed and in place of them a line of small guns would appear along the vessel's third deck. The secondary and primary batteries could, of course, be used without change. Below is seen the monster as it would appear making land. In view of its total length, possibly eleven hundred feet or more, it would have no trouble in making its way over any kind of terrain, since it would be equipped with the caterpillar treads. It would be supplied with the largest bore guns possible and extra powerful engines.

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# Awards of $1000 Monthly Prizes.

## Uniformity of Quality Makes Work of Awards Hard for Judges.


| Name | Page |
|---|---|
| **FIRST PRIZE $100.00** | |
| Raymond Francis Yates | 977 |
| **TWO PRIZES $50.00 EACH** | |
| Don Home | 962 |
| C. A. Oldroyd | 974 |
| **TEN PRIZES $25.00 EACH** | |
| Lyman Mason | 966 |
| Dr. Albert Neuburger | 975 |
| Dr. Armin DeMuth | 980 |
| Ismar Ginsberg, B. Sc., Chem. Eng. | 982 |
| Phil Gersdorf | 986 |
| Laurence H. Snyder | 987 |
| Chas. Marton | 988 |
| Harry H. Dunn | 990 |
| L. J. Smith | 996 |
| Armstrong Perry | 1005 |
| **FIVE PRIZES $20.00 EACH** | |
| George A. Luers | 990 |
| Walter Gibson | 994 |
| Leonard J. Edick | 996 |
| W. L. Pearce | 1007 |
| Paul Oard | 1007 |
| **TEN PRIZES $15.00 EACH** | |
| Adolph Ruhland | 981 |
| A. F. Anderson | 981 |
| Geo. A. Luers | 981 |
| L. H. Stuart | 981 |
| P. Cedric Wenger | 998 |
| Dale R. Van Horn | 998 |
| J. T. Garver | 999 |
| Frank W. Nightingale | 999 |
| M. Wiley, Reporter No. 3527 | 1003 |
| Walter Johnson | 1010 |
| **TWENTY PRIZES $10.00 EACH** | |
| Charles G. Percival | 982 |
| Dale R. Van Horn | 983 |
| S. Leonard Bastin | 983 |
| Dr. Albert Neuburger | 983 |
| Thomas Reed (Joy Ride Detector) | 983 |
| Dr. Albert Neuburger | 984 |
| E. S. Norton | 989 |
| Author of Fly-Gun Article | 989 |
| Dr. Albert Neuburger | 997 |
| Dale R. Van Horn | 997 |
| Dr. Albert Neuburger | 997 |
| Harold Jackson | 997 |
| Author of "Illusion" Article | 999 |
| V. B. Rickey | 999 |
| Dr. E. T. Sonendriker | 1000 |
| Dr. Albert Neuburger | 1001 |
| Raymond B. Wailes | 1001 |
| Orhan R. Coblentz | 1001 |
| J. L. Griggs | 1001 |
| A. O. Wright | 1060 |
| **TEN PRIZES $5.00 EACH** | |
| Carlyle Weiss | 1000 |
| L. B. Robbins | 1000 |
| J. G. Hobson | 1000 |
| Jacob Schmidt | 1000 |
| Robert Mackenzie | 1056 |
| Evermont Fisel | 1056 |


**Twenty Prizes $2.00 Each**
(No entries)

**Ten Prizes $1.00 Each**
(No entries)

### Here Is How You Can Get in the Contest:

## $12,000 or More in Gold

Beginning with the January issue, SCIENCE AND INVENTION will pay $1,000.00 or more each month of the year in prizes. Every article published in the regular news section will receive one of them.

(The departments have awards of their own which they will continue to give.)

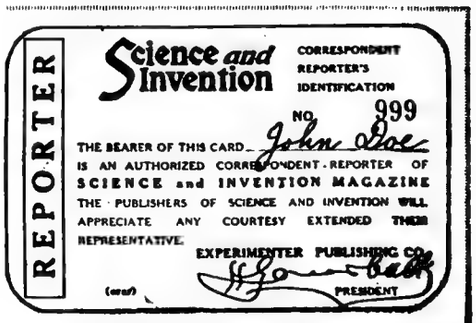
Ideas are what the editors want. They must be told simply—so your mother or sister can understand them—in pictures and sketches. Be sure they are NEW and have something to do with science or invention. The editors want pictures and sketches—must have them—but ideas are wanted most of all.—And they will be handsomely paid for. The rules of the contest will be found on page 534 of the October issue. If you haven't a copy, one will be mailed you free on receipt of your name and address. It will give full details of the rules and hints on submitting articles. The closing date for all prize contributions will be the 15th of the month preceding date of issue, i.e., 15th of December for the February number; the 15th of January for the March number, etc.

88 monthly prizes will be given as follows:

| | | | | |
|---|---|---|---|---|
| **FIRST PRIZE $100.00** | | | | |
| **2 PRIZES of $50.00 each** | | | | |
| 10 | " | " | 25.00 | " |
| 5 | " | " | 20.00 | " |
| 10 | " | " | 15.00 | " |
| 20 | " | " | 10.00 | " |
| 10 | " | " | 5.00 | " |
| 20 | " | " | 2.00 | " |
| 10 | " | " | 1.00 | " |

## WILL YOU BE OUR REPORTER?

IN Connection with our $12,000.00 prize contest announced last month, it goes without saying that you will have to hustle to win a prize. The Editors do not wish to make it hard for you; quite the contrary. We want the pictures and want them badly. Herewith is reproduced our reporter's card. We shall be glad to send it to anyone who makes an application. By means of this card you will be able to secure entry into industrial plants, business houses, motion picture studios, steamships, mines, etc. This card will prove an open sesame to you in many instances. Each card is numbered and only one is given to a correspondent. A postal card from you and a request for this reporter's card is all that is necessary for obtaining one. It will be sent you by return mail. Address Field Editor, SCIENCE AND INVENTION, 53 Park Place, New York City.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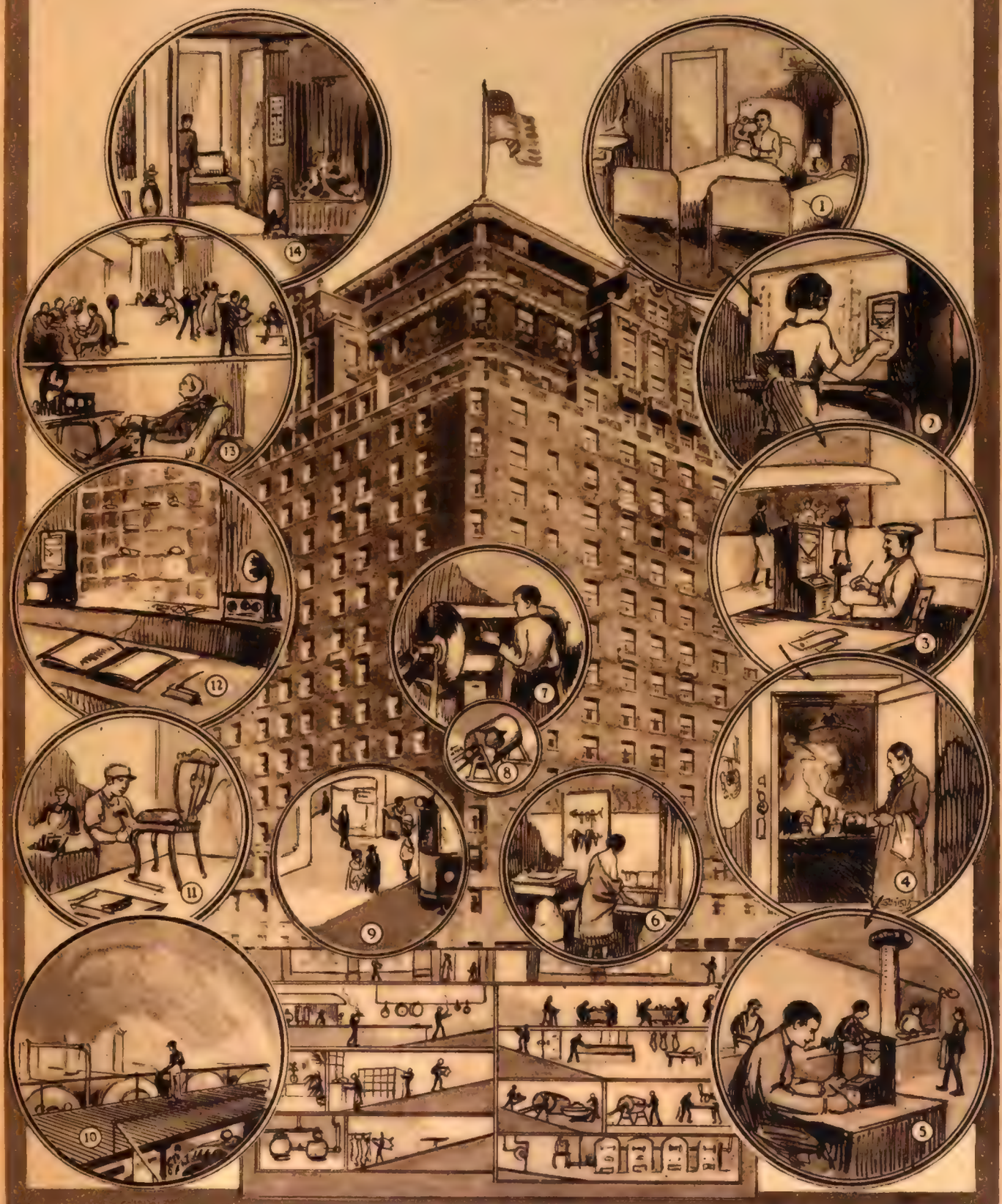
# SCIENCE SERVES IN NEW HOTEL

## Multitude of Mechanical Appliances Make Life Luxurious



In the recently completed Alamac Hotel, New York, begin at the insert 1 and follow through to 5 and see how by one operation of the telephone operator the guest gets his breakfast served to his room without disturbance. The telephone operator takes the order from the guest's telephone, writes it on the telautograph, with the result that the chef, the head waiter, and the bookkeeper all get the order. At the same time the guest leaves an order for the valet. Both orders are copied at the same time and there is no duplication. The servidor enables the hotel attaches to leave the food for the guest without disturbing him, since the door houses the food (Fig. 4). A microphone on the roof carries music from the orchestra to a broadcast station. Guests in the rooms with receiving sets hear the music without leaving their easy chairs. At 7 and 8 is shown the automatic silver polisher; at 10 the water filters which clean all water used in the hotel; at 11 is shown the repair shop. At 14 are the elevators equipped with seats. At 12 the radio set in the office. Below, four floors beneath the street connected with inclined planes.

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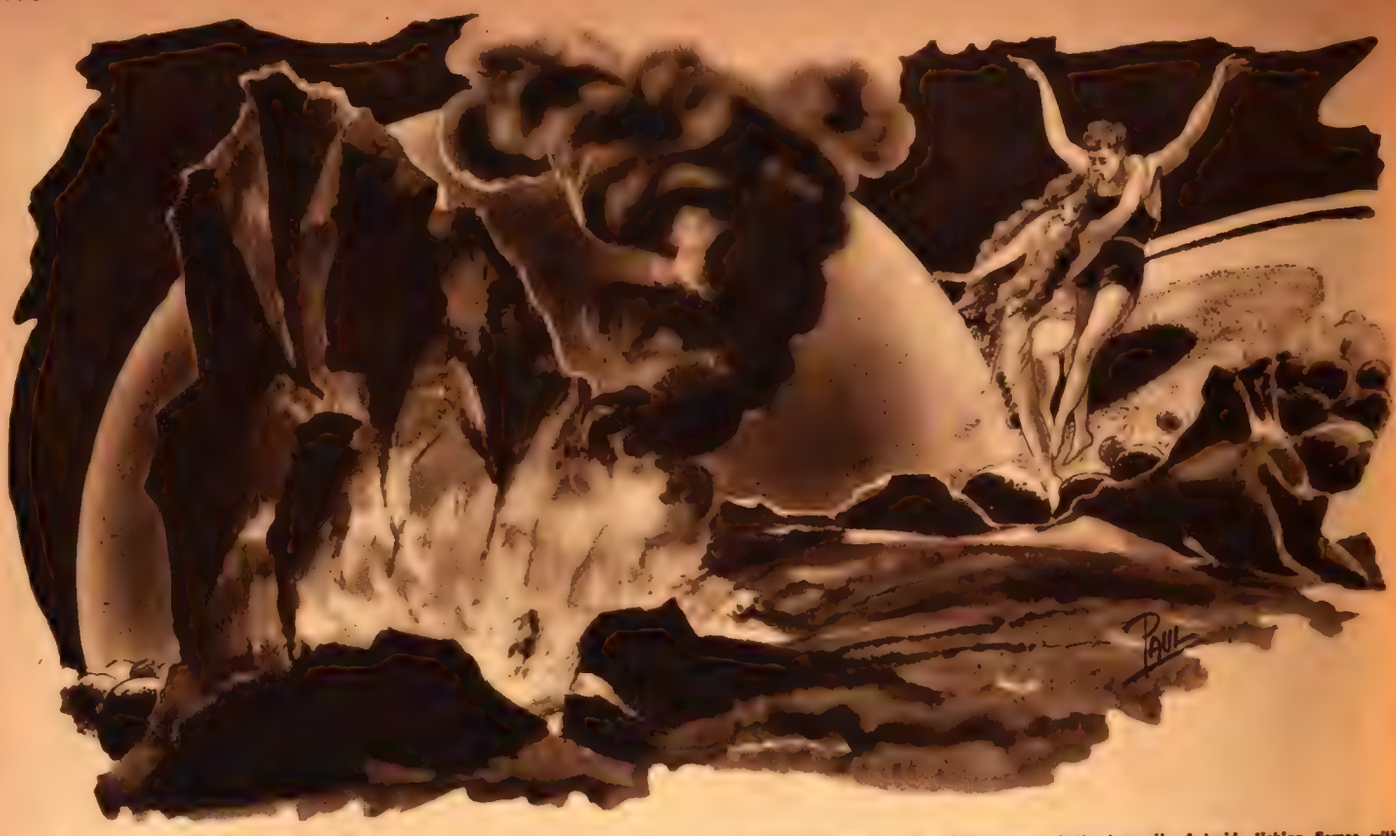

The fire came to the surface. The vicinity of the cave was glowing with molten, burning rocks. The ground all around the cave-mouth soon fell inward. A seething crater was exposed where the cave had been—a bottomless pit of lurid, licking flames with black smoke rolling up from it, and the hissing of steam knew.

# The Man On the Meteor

## By RAY CUMMINGS

### PART II.

### SYNOPSIS OF "MAN ON THE METEOR"

#### CHAPTER I

WITH no memory of past events, a young man suddenly comes to his senses on a meteor which is part of one of the Rings of Saturn. He finds that, due to the small size of the meteor, his body weighs very little and he experiences great difficulty in walking. Being hungry and thirsty, he looks around for nourishment and finds the mouth of a cave. As he looks toward the cave a girl comes into view. At the same time she catches sight of him. Suddenly she leaps into the air with a motion similar to that of a swimmer in water and sails gracefully away.

The young man, who calls himself Nemo, enters the cave and after traversing some little distance finds it to be illuminated by the phosphorescence of the rocks forming its walls. He finds flowing a stream of milky white fluid. He drinks and refreshes himself and discovers some food.

Lying down on the girl's couch, he soon is lost in slumber. Upon awakening he sees her standing nearby and starts toward her, whereupon she leaps into the air and "swims" to a nearby ledge. He pursues her, but she constantly evades him. Soon, exhausted, he lies down once more and sleeps. He is awakened by the young lady stroking his hair. They become friends. She teaches him how to jump thousands of feet into the air and return, using a peculiar swimming motion. Soon after, they enter the cave, and the girl catches and kills a huge lizard-like creature. They cook and eat the flesh of the animal. Nona, as Nemo has named the girl, watches him intently. Nona comes over to his side. For a moment they are silent, Nemo's heart racing madly. Suddenly, he takes her into his arms.

Thus Nemo has found his habitable world and his mate—beyond which the legitimate needs of man do not go.

YOU ask me to tell you more about Nona and our life on the meteor? You shall have it, of course. But if you are among those who doubt me—if you are the sort inclined to scoff at everything beyond your own knowledge or your intellectual capacity—I beg you to read no further. My narrative is not for such as you.

You will recall that my first recollection of my existence was when I found myself a man of twenty, according to earthly standards, on a tiny meteor in the Rings of Saturn. I detailed my meeting with a girl-woman fashioned like myself—our primitive love and union

The cave was full of smoke. Beside me was what seemed a pit of fire. The heat from it was intolerable. Across the cave we stood trembling with fright, regarding the red monster of fire that had eaten for itself an open pit in the cave-floor.

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In the sleigh were two Marinoid men—the larger of them elaborately clothed. The sleigh halted abreast of us. The smaller of its occupants stood up and shouted vehemently.

And suddenly I realized that he was shouting at me! My captors were lying prone on the sand, and had pulled Nona down with them. . . . but left me standing alone.

The days that followed were happy ones for us both. We lived in our cave and seldom left it. The securing of food, preparing it, eating it, and sleeping until we were hungry again—this was our life.

Animals, yet both of us with the latent intelligence of civilized human beings! Our spoken language came very fast. We seemed to be pent up with words, which once spoken were remembered almost without conscious effort. So it is with your Earth-child who are the despair of their parents because sometimes they do not talk until they are almost two years old. They have it stored up—and when they do give voice, their fluency is amazing.

Our language? I cannot tell you what it was; I do not know. It seemed almost as though we were inventing it as we went along. Yet all languages seem identical to their native users; and my English translation here will suffice.

Nona, in her spiritual and mental existence, was the counterpart of myself. Who she was, where she had come from—those questions she could not answer. Her mental life had started on the meteor with herself almost a matured woman. One's mental life, you will realize, is dependent exclusively upon memory. And Nona's memory previous to the time of our meeting, was short and dim. Perhaps human memory only exists with spoken language—or social intercourse or a similar kind. I do not know. Even your hermit speaks, or has spoken to his fellow man.

Living things! I would capture and kill one for food. But as they came steadily closer, I saw that each of them was nearly as large as ourselves—and there were ten or more of them. I trembled; and Nona and I drew back into the fern to hide. The things continued to advance. Soon I saw that they were upright, coming along the sand as though walking, slowly but steadily.

### OTHER INHABITANTS

So much for Nona. As I say, we lived and loved in our cave—two human creatures alone on our world. That was a fallacy, as you will shortly see. There were thousands of others—not like oursleves indeed—but "human" never-the-less—on our little meteor. But we did not know it then.

Time passed. How much time I cannot say. A month—five months perhaps. Time is as inconstant as the wind itself, as you would very soon perceive were you to live in semi-darkness, eating when you could get the food, sleeping when you were tired—and with no mechanical timepiece or its equivalent to measure arbitrarily your passing existence.

The securing of a steady and varied supply of food gave us trouble. I mention this because it had a direct bearing upon the extraordinary change in our existence soon to follow. The day came when we could not capture a lizard. The fungus-like stuff Nona was growing I had begun heartily to dislike. I had searched every corner of the cave and its passageways for a lizard and had come back unsuccessful.

Nona had started a fire and was sitting beside it drying her hair. Water was evap-

(*Continued on page* 1042)

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# Toy Ships that Run

**Construction of Toy Ship Models Is America's New Industry and Pastime.**

With the increase in speed demanded of boats the "V" bottom has become more and more prominent in the construction of hulls. Above is shown a model boat, with this form of body, under construction.

In many cases the same methods of construction are adhered to in the building of a small model as are used in the erection of the large one. Above is shown a workman placing ribs in the framework of the boat. Note the use of the keel.

Above: A model of a steam power boat is shown traveling at full speed. This model measures 48" over-all and is capable of a speed of 12 miles per hour. The boiler is tested to 200 pounds pressure.

In some cases the models are built up out of laminations, each one cut the exact size of the body. Above is shown a workman gluing the laminations together to form the body of a small racing yacht. This is a slower process but results in a strong model.

The boat shown below is furnished with a spring motor. It is finished in black with a red underbody, and the deck is varnished. It will run for about five minutes at a speed of five miles an hour, even though it measures only 24" over-all. This model is furnished complete and ready to run, or in knock-down parts to be assembled.

The vessel shown above can be obtained in knock-down form or complete. It is steam-driven, and has a four-cylinder engine and a steam boiler which supplies a super-heated steam to the driving mechanism.

In order that a model sailing boat will be a perfect sailer when it is placed into the water, both sides of the vessel's hull must be exactly alike so that the boat will be perfectly balanced. Below is shown a workman in the process of scraping a completed boat into perfect balance. This work requires great skill.

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# Realism In Ship Models

## Small Replicas of Ships Exactly Like the Originals

In making this model of the United States Shipping Board boat, "President Madison," practically the same class of skilled workmen were required as were used in the erection of the original. The woodwork involved in making a model such as the one shown to the left requires the services of the most expert pattern-makers and wood carvers.

Although only the best of materials and workmanship go into the construction of models, rough handling and extreme changes in weather conditions cause them to suffer mishaps that make extensive repairs necessary. Below is shown a model in the shop for repair. It is set upon the work table in much the same manner as its larger counterpart is set in the drydock.

Above is shown one of the old British Admiralty models in the shop for repairs. Some of these models cost upwards of $10,000, not only on account of the exquisite workmanship in them but also on account of their extreme age and the historic value connected to them. Frequently models are the only historic records.

The model of the racing yacht shown to the right is exactly like its orginial except for size. Mounted as though she were plying under full sail, the owner of the boat might well enjoy almost all the thrills of a real race while sitting before his fire comfortably with the wintry winds howling outside, so real is the effect of the model.

The craze for collecting marine models, such as the above, has taken great hold in the United States in the last few years so that models which used to be a drug on the market now constantly find buyers and many times bring fabulous sums. In the old days sailors on wind-jammers taking long cruises, many times carved some of the most exquisite models of their ships. In port, at the end of the journey, they brought possibly $5.

Photos Staff Photographer, courtesy H. E. Boucher Mfg. Co.

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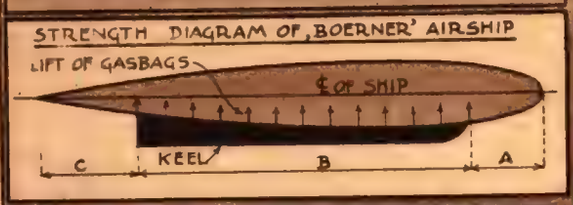
# Giant Dirigible of New Design

## Air Liner For Trans-Oceanic Service Being Constructed.

BY C. A. OLDROYD.

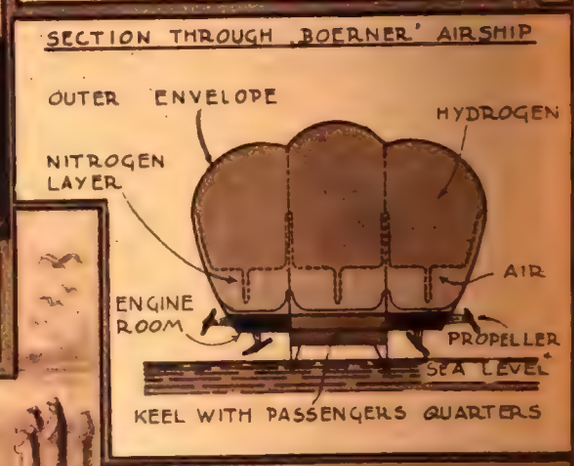
The latest semi-rigid airship called the "P. L. 27." Note the keel underneath the ship and also the engine cars which are arranged as in any modern rigid airship. In the photo above the six propeller car units are spaced evenly along the bottom. The framework and keel are of unit construction. Engine cars, however, would not be found in the Boerner vessel, the propellers of which are secured to out riggers.



FOLLOWING the keel type construction, the new Boerner trans-oceanic dirigible—the strength diagram of which is shown above—will have a gas capacity of ten million cubic feet and a total lifting power of three hundred tons. The motivating force that will carry it at an average speed of ninety miles per hour will be twenty-four engines developing a total of 6,240 horsepower. It will carry 300 people.

Below is shown a cross-section of the ship. Note that the gas bags or compartments are arranged in units and the air carried under them in order that the bags and the gas will have ample opportunity to expand as the ship rises to great altitudes. For the sake of safety there is a layer of inert nitrogen placed between the air and the hydrogen bags. The ship is fitted with pontoons so that it may land at sea.

In view of the speed the ship will be able to make it will undoubtedly be one of the outstanding mail carriers. Here is illustrated the mail room that is being installed.



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# SCIENCE SERVES IN NEW HOTEL

## Multitude of Mechanical Appliances Make Life Luxurious

In the recently completed Alamac Hotel, New York, begin at the insert 1 and follow through to 5 and see how by one operation of the telephone operator the guest gets his breakfast served to his room without disturbance. The telephone operator takes the order from the guest's telephone, writes it on the telautograph, with the result that the chef, the head waiter, and the bookkeeper all get the order. At the same time the guest leaves an order for the valet. Both orders are copied at the same time and there is no duplication. The servidor enables the hotel attaches to leave the food for the guest without disturbing him, since the door houses the food (Fig. 4). A microphone on the roof carries music from the orchestra to a broadcast station. Guests in the rooms with receiving sets hear the music without leaving their easy chairs. At 7 and 8 is shown the automatic silver polisher; at 10 the water filters which clean all water used in the hotel; at 11 is shown the repair shop. At 14 are the elevators equipped with seats. At 12 the radio set in the office. Below, four floors beneath the street connected with inclined planes.

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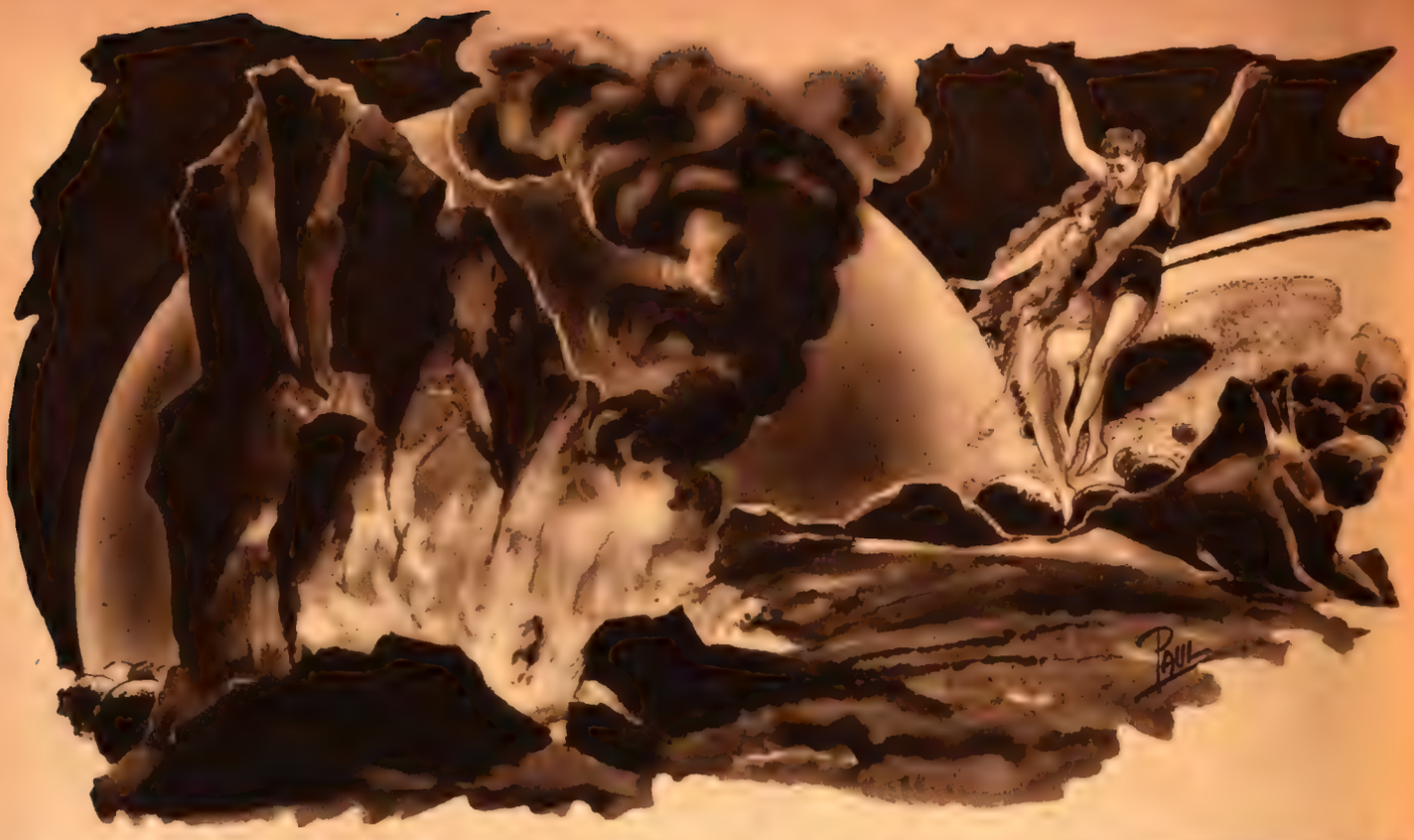

The fire came to the surface. The vicinity of the cave was glowing with molten, burning rocks. The ground all around the cave-mouth soon fell inward. A seething crater was exposed where the cave had been—a bottomless pit of lurid, licking flames with black smoke rolling up from it, and the hissing of steam below.

# The Man On the Meteor

## By RAY CUMMINGS

### PART II.

### SYNOPSIS OF "MAN ON THE METEOR"

#### CHAPTER I

WITH no memory of past events, a young man suddenly comes to his senses on a meteor which is part of one of the Rings of Saturn. He finds that, due to the small size of the meteor, his body weighs very little and he experiences great difficulty in walking. Being hungry and thirsty, he looks around for nourishment and finds the mouth of a cave. As he looks toward the cave a girl comes into view. At the same time she catches sight of him. Suddenly she leaps into the air with a motion similar to that of a swimmer in water and sails gracefully away.

The young man, who calls himself Nemo, enters the cave and after traversing some little distance finds it to be illuminated by the phosphorescence of the rocks forming its walls. He finds flowing a stream of milky white fluid. He drinks and refreshes himself and discovers some food.

Lying down on the girl's couch, he soon is lost in slumber. Upon awakening he sees her standing nearby and starts toward her, whereupon she leaps into the air and "swims" to a nearby ledge. He pursues her, but she constantly evades him. Soon, exhausted, he lies down once more and sleeps. He is awakened by the young lady stroking his hair. They become friends. She teaches him how to jump thousands of feet into the air and return, using a peculiar swimming motion. Soon after, they enter the cave, and the girl catches and kills a huge lizard-like creature. They cook and eat the flesh of the animal. Nona, as Nemo has named the girl, watches him intently. Nona comes over to his side. For a moment they are silent, Nemo's heart racing madly. Suddenly, he takes her into his arms.

Thus Nemo has found his habitable world and his mate—beyond which the legitimate needs of man do not go.

YOU ask me to tell you more about Nona and our life on the meteor? You shall have it, of course. But if you are among those who doubt me—if you are the sort inclined to scoff at everything beyond your own knowledge or your intellectual capacity—I beg you to read no further. My narrative is not for such as you.

You will recall that my first recollection of my existence was when I found myself a man of twenty, according to earthly standards, on a tiny meteor in the Rings of Saturn. I detailed my meeting with a girl-woman fashioned like myself—our primitive love and union

The cave was full of smoke. Beside me was what seemed a pit of fire. The heat from it was intolerable. Across the cave we stood trembling with fright, regarding the red monster of fire that had eaten for itself an open pit in the cave-floor.

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In the sleigh were two Marinold men—the larger of them elaborately clothed. The sleigh halted abreast of us. The smaller of its occupants stood up and shouted vehemently. And suddenly I realized that he was shouting at me! My captors were lying prone on the sand, and had pulled Nona down with them. . . . but left me standing alone.

The days that followed were happy ones for us both. We lived in our cave and seldom left it. The securing of food, preparing it, eating it, and sleeping until we were hungry again—this was our life.

Animals, yet both of us with the latent intelligence of civilized human beings! Our spoken language came very fast. We seemed to be pent up with words, which once spoken were remembered almost without conscious effort. So it is with your Earth-child who are the despair of their parents because sometimes they do not talk until they are almost two years old. They have it stored up—and when they do give voice, their fluency is amazing.

Our language? I cannot tell you what it was; I do not know. It seemed almost as though we were inventing it as we went along. Yet all languages seem identical to their native users; and my English translation here will suffice.

Nona, in her spiritual and mental existence, was the counterpart of myself. Who she was, where she had come from—those questions she could not answer. Her mental life had started on the meteor with herself almost a matured woman. One's mental life, you will realize, is dependent exclusively upon memory. And Nona's memory previous to the time of our meeting, was short and dim. Perhaps human memory only exists with spoken language—or social intercourse or a similar kind. I do not know. Even your hermit speaks, or has spoken to his fellow man.

Living things! I would capture and kill one for food. But as they came steadily closer, I saw that each of them was nearly as large as ourselves—and there were ten or more of them. I trembled; and Nona and I drew back into the fern to hide. The things continued to advance. Soon I saw that they were upright, coming along the sand as though walking, slowly but steadily.

### OTHER INHABITANTS

So much for Nona. As I say, we lived and loved in our cave—two human creatures alone on our world. That was a fallacy, as you will shortly see. There were thousands of others—not like oursleves indeed—but "human" never-the-less—on our little meteor. But we did not know it then.

Time passed. How much time I cannot say. A month—five months perhaps. Time is as inconstant as the wind itself, as you would very soon perceive were you to live in semi-darkness, eating when you could get the food, sleeping when you were tired—and with no mechanical timepiece or its equivalent to measure arbitrarily your passing existence.

The securing of a steady and varied supply of food gave us trouble. I mention this because it had a direct bearing upon the extraordinary change in our existence soon to follow. The day came when we could not capture a lizard. The fungus-like stuff Nona was growing I had begun heartily to dislike. I had searched every corner of the cave and its passageways for a lizard and had come back unsuccessful.

Nona had started a fire and was sitting beside it drying her hair. Water was evap-

(*Continued on page* 1042)

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# Toy Ships that Run

**Construction of Toy Ship Models Is America's New Industry and Pastime.**

With the increase in speed demanded of boats the "V" bottom has become more and more prominent in the construction of hulls. Above is shown a model boat, with this form of body, under construction.

In many cases the same methods of construction are adhered to in the building of a small model as are used in the erection of the large one. Above is shown a workman placing ribs in the framework of the boat. Note the use of the keel.

Above: A model of a steam power boat is shown traveling at full speed. This model measures 48" over-all and is capable of a speed of 12 miles per hour. The boiler is tested to 200 pounds pressure.

In some cases the models are built up out of laminations, each one cut the exact size of the body. Above is shown a workman gluing the laminations together to form the body of a small racing yacht. This is a slower process but results in a strong model.

The boat shown below is furnished with a spring motor. It is finished in black with a red underbody, and the deck is varnished. It will run for about five minutes at a speed of five miles an hour, even though it measures only 24" over-all. This model is furnished complete and ready to run, or in knock-down parts to be assembled.

The vessel shown above can be obtained in knock-down form or complete. It is steam-driven, and has a four-cylinder engine and a steam boiler which supplies a super-heated steam to the driving mechanism.

In order that a model sailing boat will be a perfect sailer when it is placed into the water, both sides of the vessel's hull must be exactly alike so that the boat will be perfectly balanced. Below is shown a workman in the process of scraping a completed boat into perfect balance. This work requires great skill.

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# Realism In Ship Models

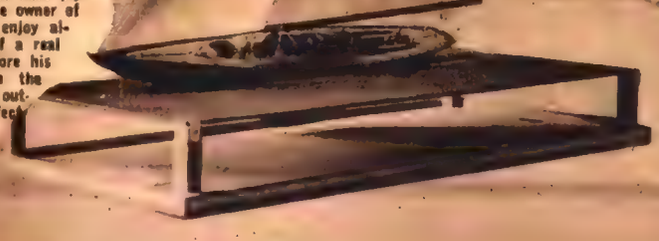
## Small Replicas of Ships Exactly Like the Originals

In making this model of the United States Shipping Board boat, "President Madison," practically the same class of skilled workmen were required as were used in the erection of the original. The woodwork involved in making a model such as the one shown to the left requires the services of the most expert pattern-makers and wood carvers.

Although only the best of materials and workmanship go into the construction of models, rough handling and extreme changes in weather conditions cause them to suffer mishaps that make extensive repairs necessary. Below is shown a model in the shop for repair. It is set upon the work table in much the same manner as its larger counterpart is set in the drydock.

Above is shown one of the old British Admiralty models in the shop for repairs. Some of these models cost upwards of $10,000, not only on account of the exquisite workmanship in them but also on account of their extreme age and the historic value connected to them. Frequently models are the only historic records.

The model of the racing yacht shown to the right is exactly like its orginial except for size. Mounted as though she were plying under full sail, the owner of the boat might well enjoy almost all the thrills of a real race while sitting before his fire comfortably with the wintry winds howling outside, so real is the effect of the model.



The craze for collecting marine models, such as the above, has taken great hold in the United States in the last few years so that models which used to be a drug on the market now constantly find buyers and many times bring fabulous sums. In the old days sailors on wind-jammers taking long cruises, many times carved some of the most exquisite models of their ships. In port, at the end of the journey, they brought possibly $5.

Photos Staff Photographer, courtesy H. E. Boucher Mfg. Co.

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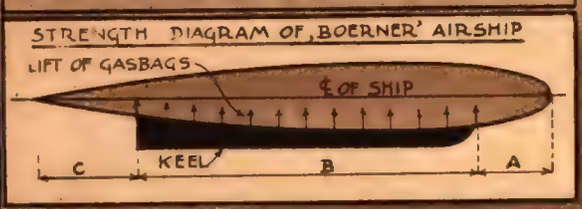
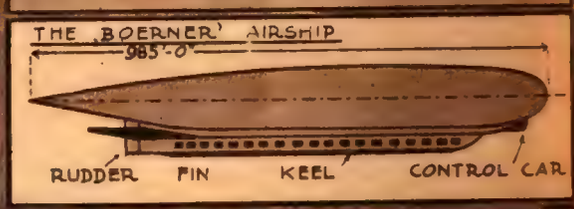
# Giant Dirigible of New Design

## Air Liner For Trans-Oceanic Service Being Constructed.

BY C. A. OLDROYD.

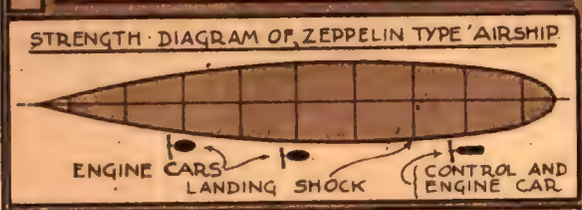
The latest semi-rigid airship called the "P. L. 27." Note the keel underneath the ship and also the engine cars which are arranged as in any modern rigid airship. In the photo above the six propeller car units are spaced evenly along the bottom. The framework and keel are of unit construction. Engine cars, however, would not be found in the Boerner vessel, the propellers of which are secured to out riggers.




FOLLOWING the keel type construction, the new Boerner trans-oceanic dirigible—the strength diagram of which is shown above—will have a gas capacity of ten million cubic feet and a total lifting power of three hundred tons. The motivating force that will carry it at an average speed of ninety miles per hour will be twenty-four engines developing a total of 6,240 horsepower. It will carry 300 people.

Below is shown a cross-section of the ship. Note that the gas bags or compartments are arranged in units and the air carried under them in order that the bags and the gas will have ample opportunity to expand as the ship rises to great altitudes. For the sake of safety there is a layer of inert nitrogen placed between the air and the hydrogen bags. The ship is fitted with pentoons so that it may land at sea.



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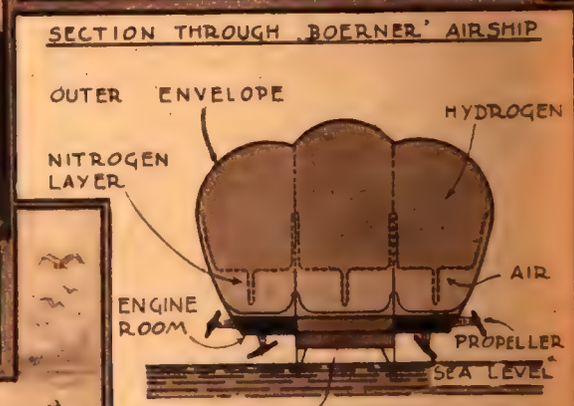

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# Science Selects Occupation

## Tests For Determining the Occupation Best Fitted to Individual

By observing how an individual matches the two halves of the square shown in the photo below, psychologists are able to determine his visual power, according to recent exhaustive tests made by German professors.

Below is shown the apparatus used in testing the tactile sense of the person considering selection of a mechanical career. Obviously, if the individual has no keen sense of touch he could hardly be expected to make an expert

For determining the initial observation point and the ability of the candidate to concentrate, Dr. Porkonsky, the psychologist, uses the above machines consisting of five pressure glasses with keys which the subject must operate in order to keep the liquids in the tubes in a certain relation.

Below is another form of the device shown above. Here the subject must concentrate on the positions of the black dashes on the cloth belts revolving at different speeds and, by key adjustment, keep the dashes opposite each other.

A memory test. Words appear in the slot of the circular machine on the table. After a certain number have passed the candidate must call them.

Test for color sense. The angle of the revolving color disc is changed and the ability of the person tested to differentiate slight shades is noted.

The small discs have two sets of holes, one that fit the wires and one that does not. Stringing them tests the operator's dexterity and nerves.

The mental dexterity of an individual with figures is tested by asking her to point to a number called out and then marking the time consumed doing it.

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# Tides to Develop Power

## Making Tides Act as Air Compressors and Using the Power So Developed.

BY JOSEPH H. KRAUS

©—1924—By Science & Invention

The inventor of this system of producing power from the tides, John S. Leger McGinn, intends to build a wall with crest rising above the highest tide across a natural basin. The wall has openings with hinged gates or flap-valves to allow the water to pass into the basin when the tide is rising, but which will close when the tide falls, preventing the water from leaving the basin. Within the basin a pipe will be built which will pass through the wall to the sea, through which pipe the water as it escapes will flow in. In doing so the water will carry a great quantity of air with it, which is caught in an air trap. This air, under the pressure it has attained, will then be used to drive the air engines and generators. The question arises, "what happens when the tide is rising or full?" This is answered in the small illustrations. When the tide is full, it is obvious that no power will be developed by the system, because no water is flowing from the basin into the sea. However, there is a storage tank from which the air passes to the generating station. The small tube in the center of the reservoir allows water to pass downward into the storage tank and forces the air out at the top.

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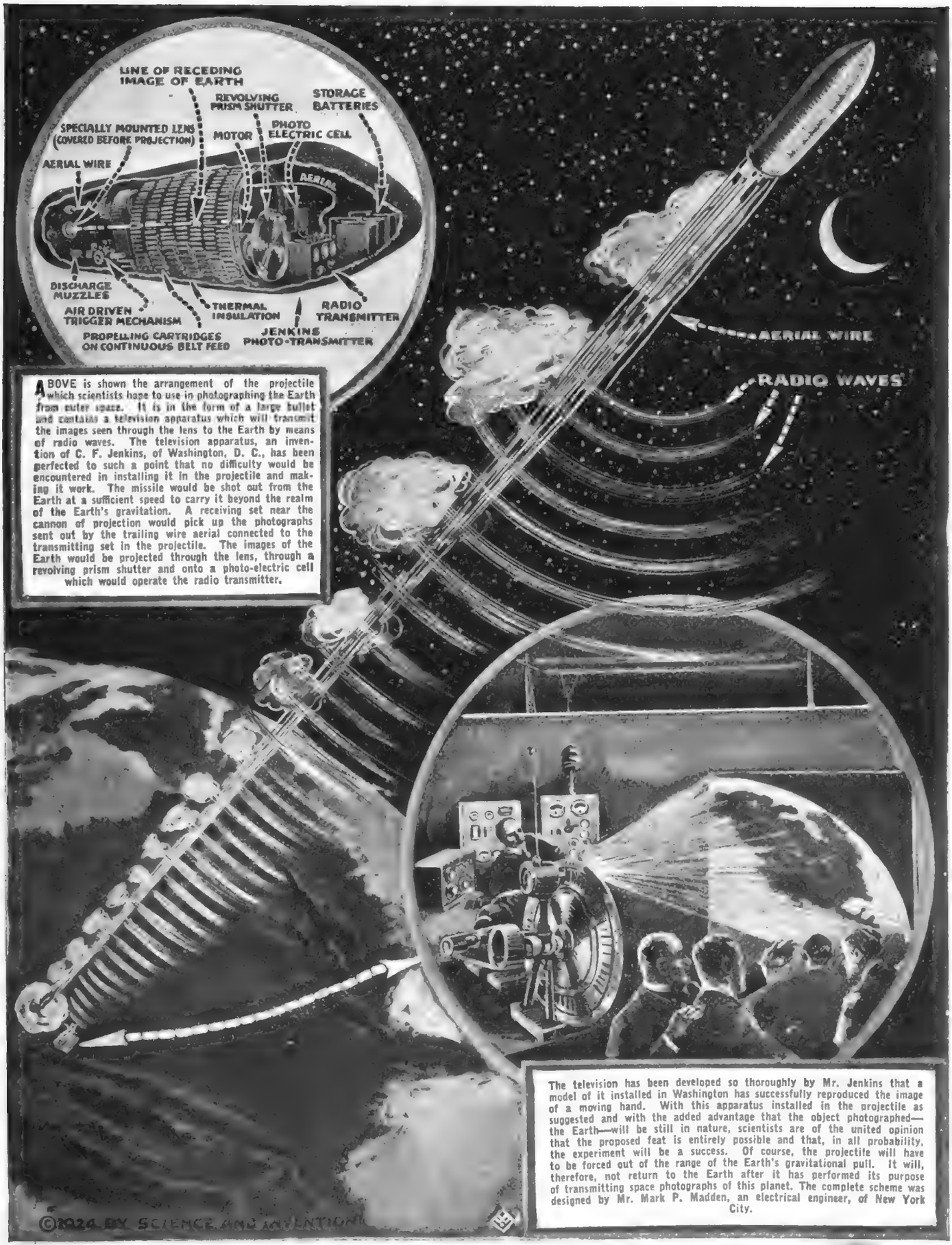
# Picture of the Earth

## Radio Television to Photograph Earth from Space.

BY RAYMOND FRANCIS YATES




ABOVE is shown the arrangement of the projectile which scientists hope to use in photographing the Earth from outer space. It is in the form of a large bullet and contains a television apparatus which will transmit the images seen through the lens to the Earth by means of radio waves. The television apparatus, an invention of C. F. Jenkins, of Washington, D. C., has been perfected to such a point that no difficulty would be encountered in installing it in the projectile and making it work. The missile would be shot out from the Earth at a sufficient speed to carry it beyond the realm of the Earth's gravitation. A receiving set near the cannon of projection would pick up the photographs sent out by the trailing wire aerial connected to the transmitting set in the projectile. The images of the Earth would be projected through the lens, through a revolving prism shutter and onto a photo-electric cell which would operate the radio transmitter.

The television has been developed so thoroughly by Mr. Jenkins that a model of it installed in Washington has successfully reproduced the image of a moving hand. With this apparatus installed in the projectile as suggested and with the added advantage that the object photographed—the Earth—will be still in nature, scientists are of the united opinion that the proposed feat is entirely possible and that, in all probability, the experiment will be a success. Of course, the projectile will have to be forced out of the range of the Earth's gravitational pull. It will, therefore, not return to the Earth after it has performed its purpose of transmitting space photographs of this planet. The complete scheme was designed by Mr. Mark P. Madden, an electrical engineer, of New York City.

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# Doctor Hackensaw's Secrets

## By CLEMENT FEZANDIÉ

AUTHOR'S NOTE.—*The average duration of human life has about doubled in the last hundred years. Before the next century has passed, it is quite possible that the average life of a man may be raised to eighty or one hundred years. The remote future may see this increase extended to a thousand years or more. Scientists have only begun to study the causes of old age, and much may be hoped for from systematic research along the path already opened by Metchnikoff and others.*

## No. 26. The Secret of Perpetual Youth

"I have discovered 'Reversible Metabolism!' I have discovered how to make the body cells remove the old, decayed portions of the tissue, and so restore to them their freshness and youth. The reason a man grows old and dies is that the tissues of one or more of his organs grow old, that is to say, the tissues either decay or harden; or, through the accumulation of foreign matter, the organ becomes unable to perform its functions properly. The hardening of the walls of the blood-vessels, is, according to Metchikoff, the chief cause of senility; that is to say, of old age. There are, of course, many other contributing causes, as I discovered when I began my researches on the subject.

Without a tremor, Mrs. Young drew up her sleeve. He then withdrew a few drops of blood, which he wished to have as a control, and he placed them in a test-tube filled with Carrel's solution. Then he injected into the arm a small amount of the pure culture of the new microbe.

"IS it possible, Doctor Hackensaw, that you have discovered the secret of perpetual life?"

The speaker was a somewhat decrepit old lady of eighty-five, Mrs. Linda Young by name, who had hobbled into the doctor's office on hearing rumors that the doctor was seeking the "Elixir of Life"; that will-of-the-wisp that had been sought, for centuries, by the old alchemists.

Doctor Hackensaw smiled. "No, Mrs. Young," said he, "I should hardly call it 'perpetual life.' But I have discovered what biologists would call 'reversible metabolism.' I suppose you know what anabolism and catabolism are?"

"They're some new-fangled varieties of Socialism, aren't they?"

"No, nothing of the sort. They are terms used in physiology. Anabolism is the growth of any tissue, and catabolism is the decay and death of the tissue. Metabolism is 'life,' and consists in the continual growth and decay of tissue."

"Then what is it that you have discovered?"

### METHOD OF RESEARCH

"I started out with the knowledge that life is practically immortal, or to put the phrase more correctly, every animal alive today is nothing but a continuation of the splitting up of the original speck of protoplasm from which all animals and plants have descended. Every man's ancestry must go back in an unbroken line to this primordial speck. Now an individual whose tissues are already old and decaying can still produce sperm cells or ova capable of starting not only one new life, but a perpetual succession of new lives—in other words, a life that may last hundreds of thousands of years—until all life on this earth is extinct.

"I spent years in my researches. I first studied old age in plants. Why does a tree die? Certain olive trees are said to be two thousand years old. Why should they not live forever? But the study of plants did not help me much. A tree dies because the new wood forms on the outside of the old trunk, while the inner wood decays, leaving the center hollow. The conditions with human beings are totally different: old age may be due to the improper digestion of the food, to troubles with the lungs or the other organs of respiration, or to troubles with the circulation of the blood, or the nervous system——"

"But, doctor," interrupted Mrs. Young, yawning, "I'm afraid I'm too stupid to understand all your scientific terms, and I want to get home in time to attend to the 'metabolism' of my family—my children and grandchildren; and I want the dinner to be especially nice today because I am expecting Mr. Trimble. Mr. Trimble is a widower of forty-five, and to tell you the truth, doctor, I have fallen in love with him. Now I learned that you have discovered the 'Elixir of Youth,' and I came to see if you wouldn't consent to make me young again. I am a rich woman, Doctor Hackensaw. My husband was a multimillionaire and he left me the bulk of his property. I am eighty-five years old now, and I will gladly pay you a million dollars if you succeed in making me young again——"

"And if I fail?"

"If you fail, I lose nothing. I have been suffering lately from a general debility, and the doctors tell me I have only three months more to live—probably three months of pain

But in spite of these efforts, Linda became a babbling eight-months-old baby, incapable of making her wants known except by simple gestures. She could, however, answer Doctor Hackensaw's questions by affirmative or negative gestures, so by calling off the letters of the alphabet in turn he could learn any of her wishes. She retained her liking for cigarettes and cocktails, and it was curious to see this eight months old baby attempting to smoke a cigarette, or sucking a cocktail from her milk bottle. One day she asked to see her children and grand children, wishing to be held by each in turn, and she took a malicious pleasure in striking them and scratching their faces, to make up for the many times they had done the same to her when they were babies.

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and suffering. I will most willingly risk losing these three months on the chance of being restored to youth again——"

Doctor Hackensaw hesitated. "My experiments so far," said he, "have all been on animals. I can take a tough old rooster or a cow old enough to make boarding-house steak, and restore them to their pristine youth. I make a business of taking old and worn-out thoroughbred horses and after making them young again, selling them at a handsome profit. Especially am I interested in the finest pedigreed stock whose owners are willing to pay fancy prices for the rejuvenation of a full-blooded bull or stallion. But my experiments on human tissue have been comparatively few, and only on amputated arms and legs—never on an integral human being. Besides, while I have succeeded in making animals grow younger, I have not yet discovered the means of checking this process of reversible metabolism. In other words, even if I should succeed, you would continue growing younger and younger unless I have the good luck of discovering some antidote."

"I will take all risks and assume all the responsibility. I will have my lawyer draw up a paper absolving you from all blame. As I said before, I have nothing to lose, and everything to gain."

"Very well, madam," said the doctor. "Make your will, set your affairs in order and come back next Monday morning. I shall have everything ready for you by that time."

* * *

**READY FOR THE OPERATION**

"Will the operation be very painful, doctor?" asked Mrs. Young, as she took her seat on the operating chair.

"No more than an ordinary vaccination," replied Doctor Hackensaw. "Had you come to me a year ago I should have had to put you under an anaesthetic while I cut one of your arteries and inserted a T-piece provided with a stop-cock at the cut, so as to be able to remove old blood or inject new ingredients. In fact, in my early experiments I made Siamese twins of my subjects. I attached a young animal to the old one I wished to rejuvenate, and would daily remove a small amount of the old blood. It was thus fresh young blood that coursed through both bodies, and the older animal profited to a great extent by the vitality of the young one. But the process was clumsy, and I found that new blood would not completely restore the hardened or decayed tissues. It would only partially soften the hardened walls of a blood vessel, and it would not remove from the bones the deposits of lime that the years leave, and that change the soft cartilaginous bones of the infant into the brittle bones of the old man. It was not until I discovered my new microbe that I was able to secure real results."

"Your new microbe?"

"Yes, the *Bacillus Hackensavii*. While experimenting with a new stain for staining microbes, I came upon an altogether unknown species of bacillus, possessed of the most wonderful properties. Instead of attacking healthy tissue, like the disease germs, this one seems only to attack old and decayed tissue. Such being gradually removed, the body can replace the old tissue with fresh new cells."

"But can an old body produce young and fresh cells?"

"Yes, indeed. All new cells when first produced are young and new and capable of indefinite growth. Now, if you will kindly bare your arm, I shall proceed to make the inoculation."

Without a tremor, Mrs. Young drew up her sleeve and Doctor Hackensaw deftly made a slight incision with his lancet. He then withdrew a few drops of blood, which he wished to have as a control, and he placed them in a test-tube filled with Carrel's solution. Then he injected into the arm a small amount of the pure culture of the new microbe.

"There madam," said Doctor Hackensaw, "it's all over!"

"Is it possible? Is that all? Well, doctor, if that little scratch is going to make me young again, you will have earned your million dollars pretty easily——"

"Madam," replied the doctor, "I'll guarantee that, barring accidents, you will soon begin to regain your youth, but as I told you, I cannot promise to stop the process as I have as yet found no way of checking the action of the microbe."

"Never mind," cried the old lady gayly, "I feel younger already. You needn't be in any hurry about hunting for the antidote!"

A week later Mrs. Young again repaired to the doctor's office.

"I'm afraid something has gone wrong, doctor," she said. "Not only do I not feel any younger than I was, but I feel somewhat older and weaker."

(*Continued on page* 1053)

One day Doctor Hackensaw was electrified by a vision of fairy-like loveliness that swept into his office—an exquisite young girl, looking not more than eighteen entered the doctor's office one night, and astonished that gentleman by throwing her arms around his neck and kissing him affectionately.

And still she grew younger. Doctor Hackensaw would spend hours pacing the floor, with this baby widow in his arms, reading her the newspaper or passages from Milton's "Paradise Lost." Meanwhile his powerful brain was striving hard to devise some means to check the fatal catastrophe that seemed about to terminate the experiment which had begun so favorably.

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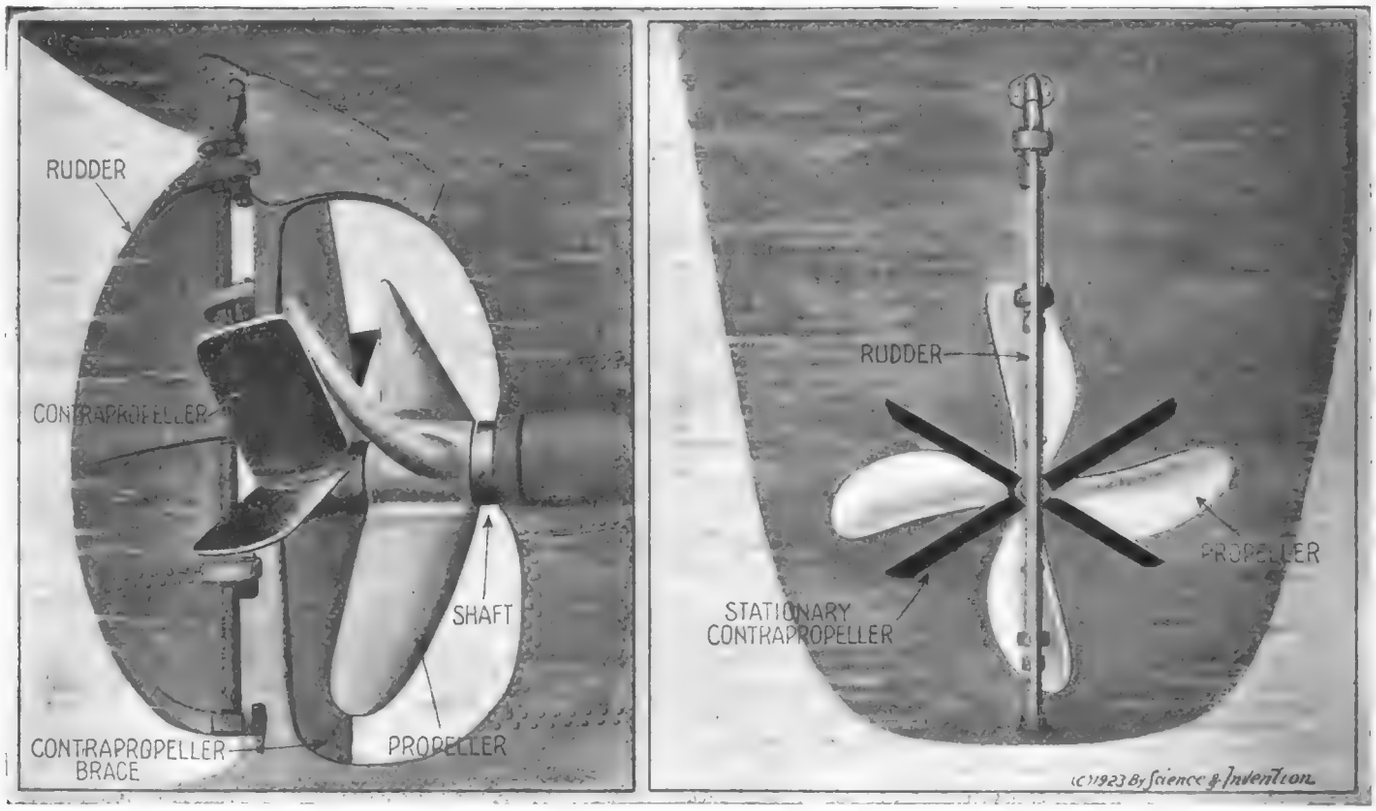
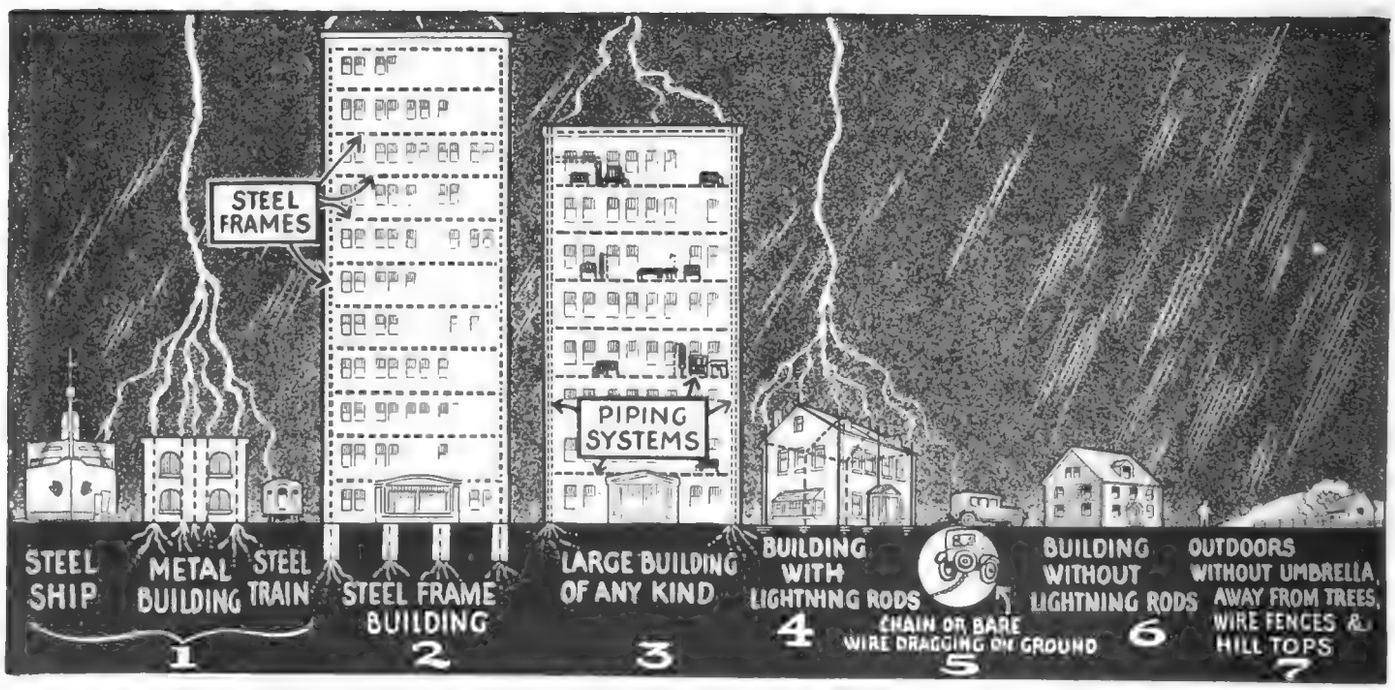
# Contra-Propeller Speeds Ships

**Efficiency of Ship's Screw Increased 15 per Cent.**




The contra-propeller for vessels is a four-bladed stationary affair placed just in back of the engine driven propellers. It has been definitely proven that this stationary set of blades materially increase the speed of the ship without increasing power consumption to the extent of even 15 per cent. It has been given a thorough test on sea-going vessels and as a matter of fact is part of the equipment on a modern German trans-Atlantic liner. The theory of operation is that the whirl of water produced by the propeller ordinarily prevents that portion of the blade nearest the hub from effectively acting on the water. The contra-propeller breaks up the whirl. Contributed by Dr. Armin Demuth.

# The Safest Place in a Thunder-Storm




That a mod… skyscraper with its mass of steel as a frame-work, is the safest possible place in… storm is the dictum of S. M. Schoon, Chairman of the committee for P… ightning, of the National Fire Prevention Association. He ranks the … ows: Steel ships and buildings, first; steel framed skyscraper and large building of any kind, second and third; a building protected with lightning rods, fourth; steel or metal bodied automobile with chain dragging on the ground, fifth; building without lightning rods, sixth; out of doors without umbrella and away from fences and hill tops last. And keep away from grounded metal objects in houses.

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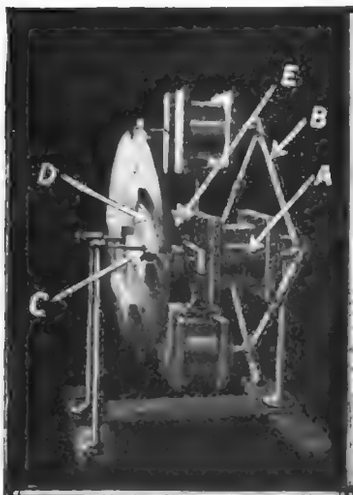
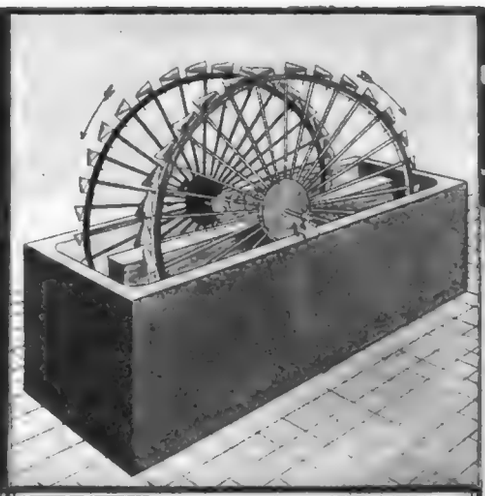
# As Ever, the Perpetual Motion

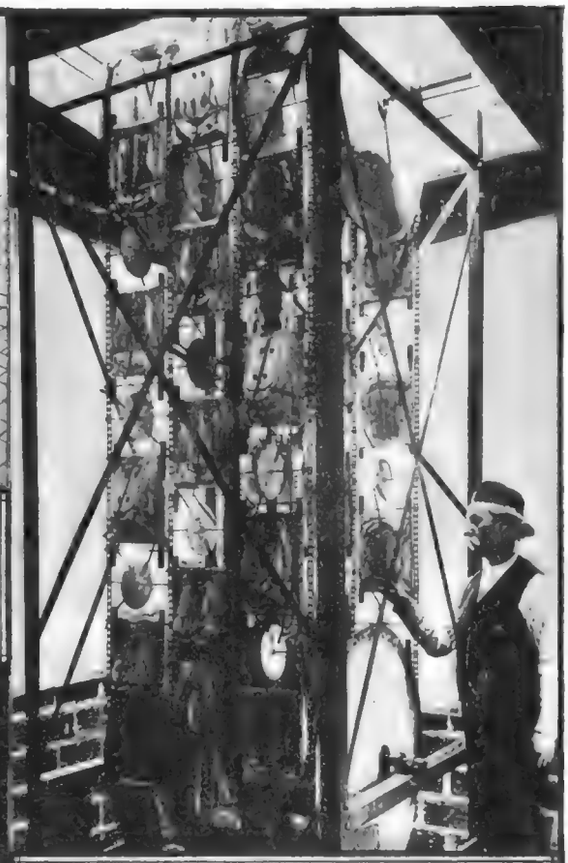
**Science & Invention Will Pay $1,000.00 to Anyone Who Will Demonstrate That Any of These Models Work**



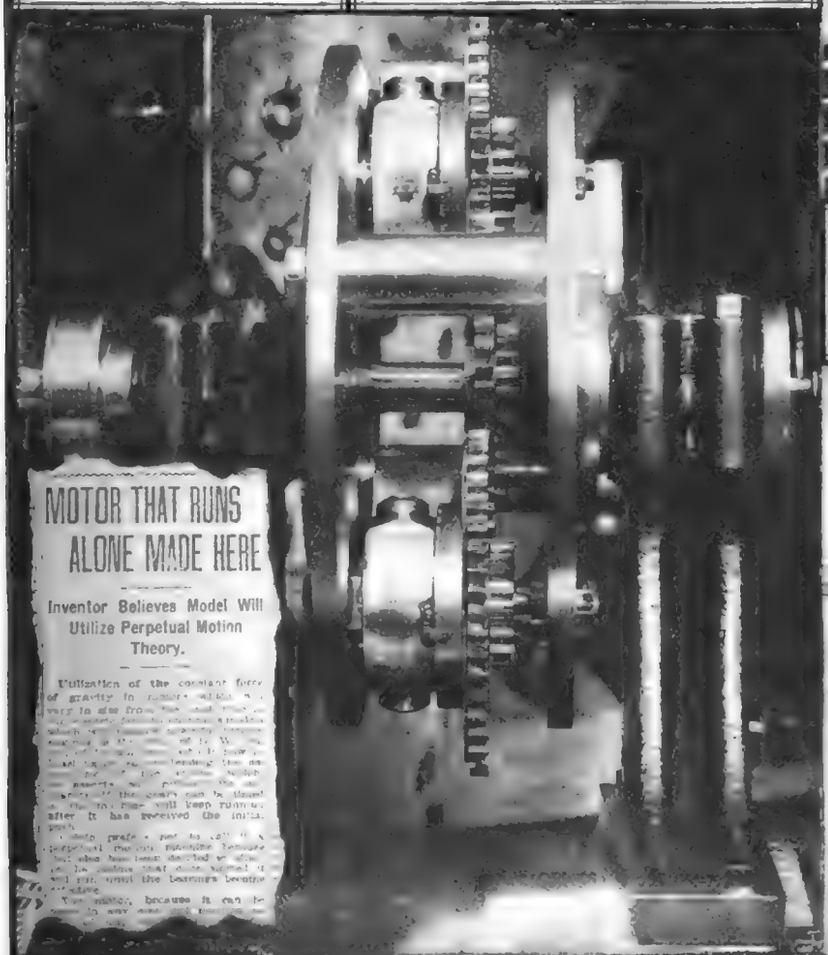

A machine invented by Adolph Ruhland is composed of two collapsible cylinders connected in such a way that the bottom cylinder is filled with air through the pipe, B, from the top cylinder when the two are vertical. The air forced into bottom cylinder raises it to the top where the action repeats.



Here the buoyancy principle is again involved. The little triangle-like affairs around the rim of the wheel are bellows. As the wheel descends into the water, pistons in the spokes connecting with the bellows fall and force air into the collapsible chambers giving them buoyancy. When they reach the top portion of the stroke they return to their former position in the spoke deflating the chambers and so are supposed to keep the wheel moving.



The inventor of this device, Rufus Ames, claims not only that he has invented a perpetual motion machine but that its operation will revolutionize the laws of physics. He calls the contraption the "Still Water Motor," and says that it is the latest source of power. No official tests of the machine have been made. Note the three separate series of rotors. The whole thing is built on a steel frame and the rotors are carried by regular cog chains.

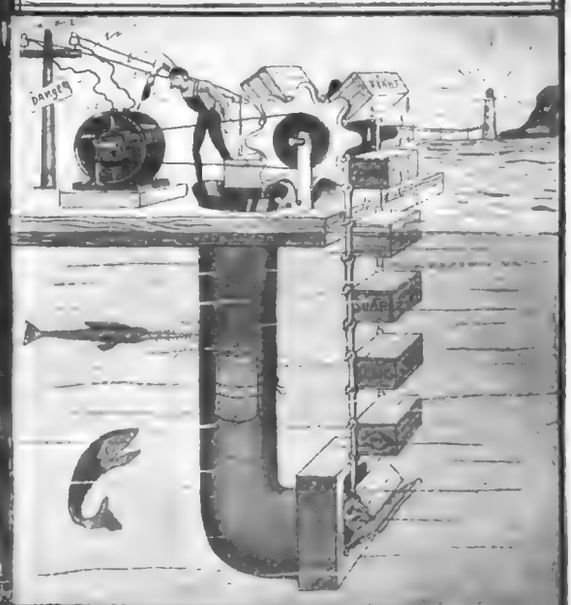


## MOTOR THAT RUNS ALONE MADE HERE

### Inventor Believes Model Will Utilize Perpetual Motion Theory.

Utilization of the constant force of gravity in rotary motion [illegible] will keep running after it has received the initial push.

More powerful claims yet are made for the machine shown in the above photo. The inventor, W. D. Colvin, of Philadelphia, claims that here (as elsewhere on this page), the constant force of gravitation will be utilized to do the work of the world. At the present time the inventor is in Washington supervising the assembly of a model of his apparatus which he hopes will gain the attention of the scientists. It is said by the inventor that the machine can be made in all sizes and that it will be used in the future to take the place of powerful turbines. G. A. Luers is the reporter of this curious attempt at the impossible.




But here is the real one! Soap boxes are fastened to a chain which revolves around the gear-like pulley on the float, as shown in the illustration. The boxes go down into the water through a large pipe and pass through a water tight valve. Once in the water they become buoyant and lift themselves up, causing the motor to run. The only trouble with the machine is that no account has been taken of getting the boxes out of the pipe. L. H. [illegible].

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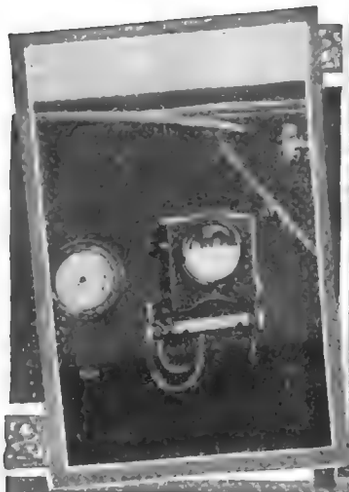
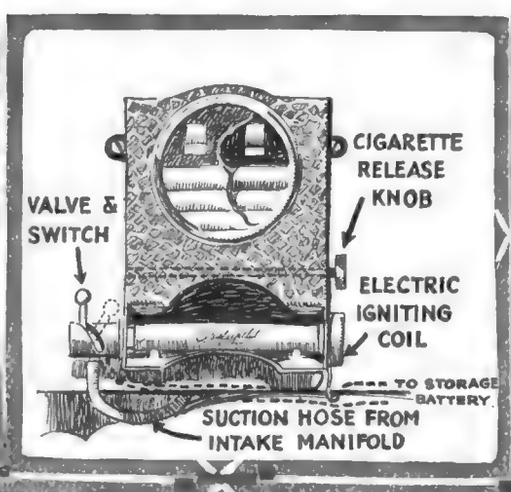
# Auto Cigarette Lighter—Novel Pump

**Exhaust Suction and Incandescent Coil Form Car Lighter.**





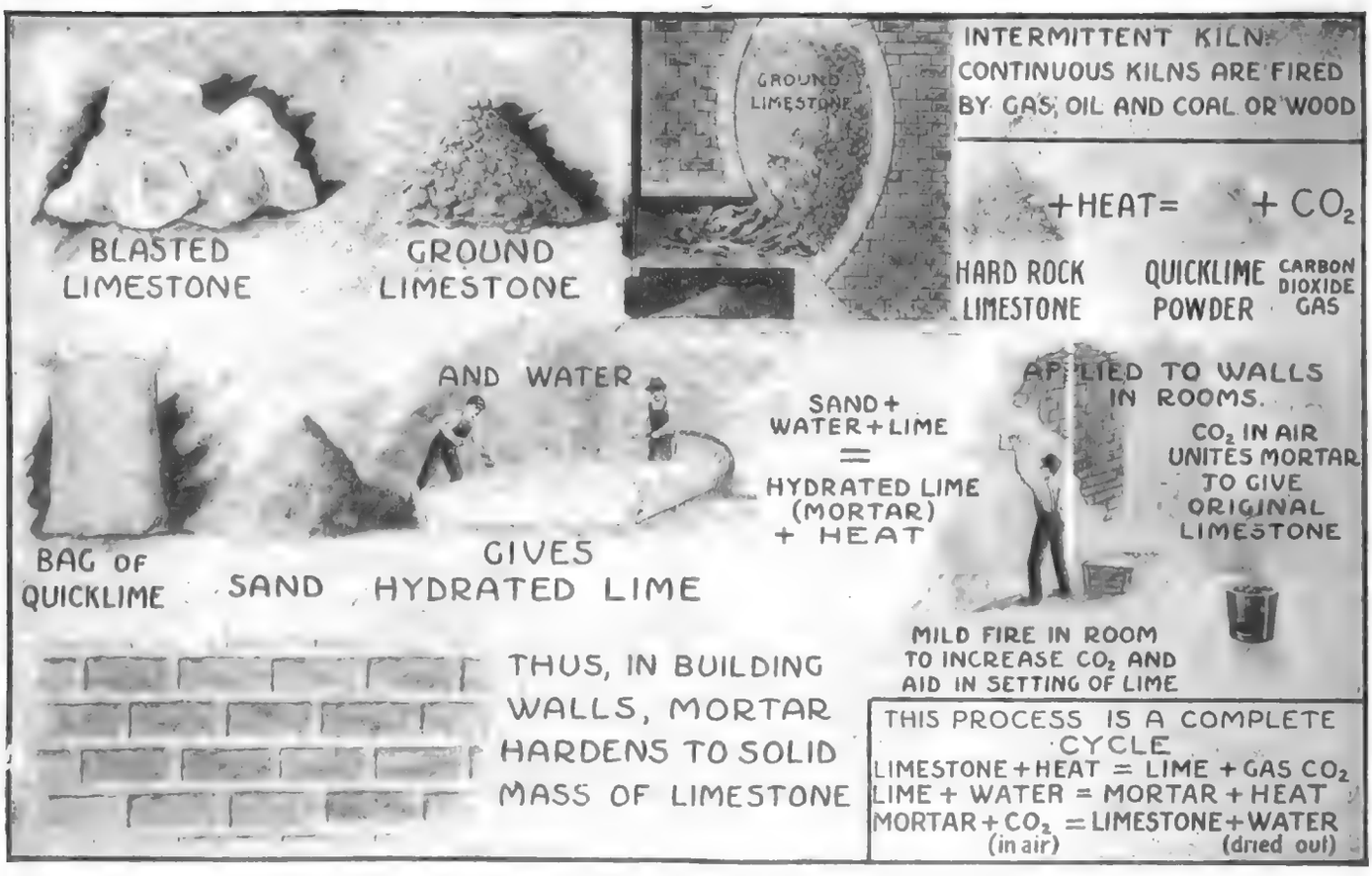
Cigarette cases that throw the cigarette to the smoker are more or less common, but one that drops them into the smokers' fingers lighted, are more or less uncommon. Attached to the dash of a car, the little device shown above does just that. The cigarettes from the package drop into a holder. One end rests against an incandescent coil while the other fits into a receptacle attached to the exhaust which draws a draft of air through the cigarette, lighting it. It then drops to the smoker's fingers. —Chas. G. Percival.

At the right is shown an English pump with which one man may raise 1,000 gallons of water from a depth of 300 feet per hour. A coil-like cable simply revolves through the water, causing capillary attraction, thus causing a constant stream of water to flow to the top of the well.

# The Complete Limestone Cycle

**How Artificial Stone Is Made for Building Purposes.**

By ISMAR GINSBERG, B. Sc. Chem. Eng.


BLASTED LIMESTONE
GROUND LIMESTONE
GROUND LIMESTONE
INTERMITTENT KILN. CONTINUOUS KILNS ARE FIRED BY GAS, OIL AND COAL OR WOOD
+HEAT= + $CO_2$
HARD ROCK LIMESTONE
QUICKLIME POWDER
CARBON DIOXIDE GAS
AND WATER
BAG OF QUICKLIME
SAND
GIVES HYDRATED LIME
SAND + WATER + LIME = HYDRATED LIME (MORTAR) + HEAT
APPLIED TO WALLS IN ROOMS.
$CO_2$ IN AIR UNITES MORTAR TO GIVE ORIGINAL LIMESTONE
MILD FIRE IN ROOM TO INCREASE $CO_2$ AND AID IN SETTING OF LIME
THUS, IN BUILDING WALLS, MORTAR HARDENS TO SOLID MASS OF LIMESTONE
THIS PROCESS IS A COMPLETE CYCLE
LIMESTONE + HEAT = LIME + GAS $CO_2$
LIME + WATER = MORTAR + HEAT
MORTAR + $CO_2$ = LIMESTONE + WATER
(in air)
(dried out)

The illustration tells graphically how limestone is reduced to lime so that it may be ready for use in building and how it is again turned into stone to give the building strength. The rough stone is heated. The fuel reduces part or all of the carbon dioxide in the stone to carbon monoxide which has no affinity for the calcium of the stone. At the conclusion of the heating the rock lime is removed and barrelled for sale. In use it is slaked with water which changes the calcium oxide to calcium hydroxide. This is mixed with sand and used in buildings for plaster and mortar. The carbon dioxide of the air then unites with the calcium hydroxide, forming the original limestone again.

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# Quite Cool

You might be cool as a cucumber and yet lack something in frigidity; but to be cool as a squash is quite the bee's knees, so to speak. Above, the photograph shows the interior temperature of the squash to be sixty degrees while the surrounding air swelters at 118.—S. Leonard Bastin.

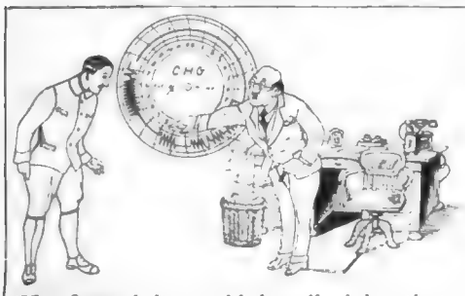
# Pigs' Feet Nature's Feat

Otherwise healthy in every respect, this pig raised on a Nebraska farm has a wealth of toes—24 of 'em. Its six brothers and sisters born at the same time it was are perfectly normal in every way. —Dale R. Van Horn.

# Airplane That Can Be Folded For Transportation

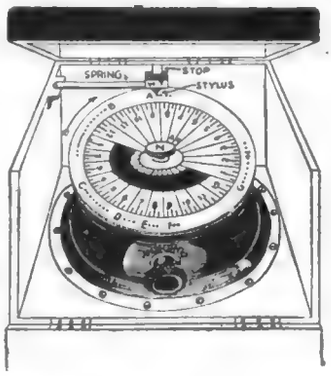
This small one-seater airplane of German make is constructed so that the wings fold on their longitudinal axis and fold back around the body and tail. One man can fold or unfold the plane. No packing is necessary if the machine is to be transported by rail. —Dr. Albert Neuburger.

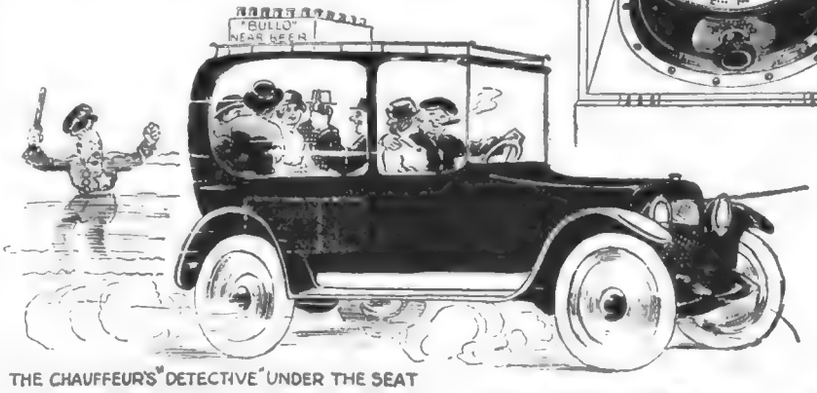
# DETECTOR FOR CHAUFFEUR'S JOYRIDES



"He figured it would be all right, that chauffeur did, to take his girl and a gang of his cronies for a nice little jaunt," said Brown, the chauffeur's boss, "and he would have gotten away with it, too, and six gallons of my gas, only he didn't know that the garage put in this little card and a dingus to make it register the movements of the car." And here he brought a disk out of his desk. It was circular and had markings for the hours. Around the outside of the disk was a crooked broken line. "That," he said, as he ground his cigar between his teeth, "is where my gas has been going. See that jagged part of the line between nine P. M. and two in the morning. Well, he was out usin' my gas then and thought I didn't know it, but this disk was revolving on the hour spindle of a clock, under the back seat, and a pen at the end of a spring fixed over the revolving disk bounced up and down on it with the vibrations of the car and gave me the undisputable evidence. Sure I fired him."

This instrument is of German manufacture. The idea, however, was put forward in the September, 1919, issue of SCIENCE AND INVENTION, page 414.




THE CHAUFFEUR'S "DETECTIVE" UNDER THE SEAT

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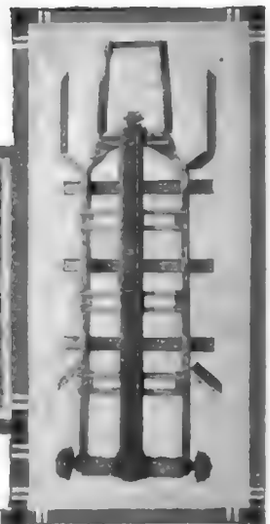
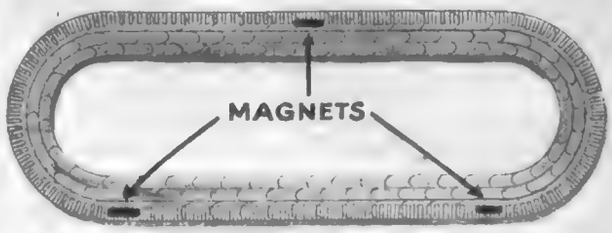
# Traveling Walk to Replace Subway

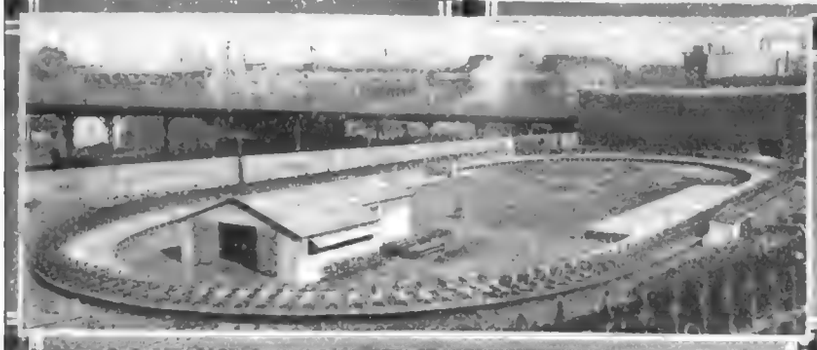
THE world famous subway shuttle across Forty-Second Street in New York City, may be replaced with a moving sidewalk built in three sections running at three, six, and nine miles per hour, respectively. A company has been organized to build the new magnetically propelled carriage and complete working models have been constructed. Above is shown a section of the model and its method of operation. Benches are installed on the fastest moving platform.

Above is shown a section of the complete arrangement with the three moving platforms. The slots marking the connection point between the sections out of which the device is made may be easily seen. Each section is approximately six feet in length. The floors are of wood, the frames of fabricated steel.

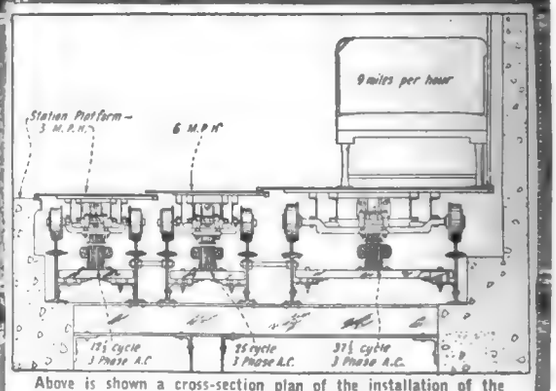


Above is shown the skeleton of one section. The two wheels at the rear run on rails. The front of the platform is supported on the rear of the one before it, to which it is attached.



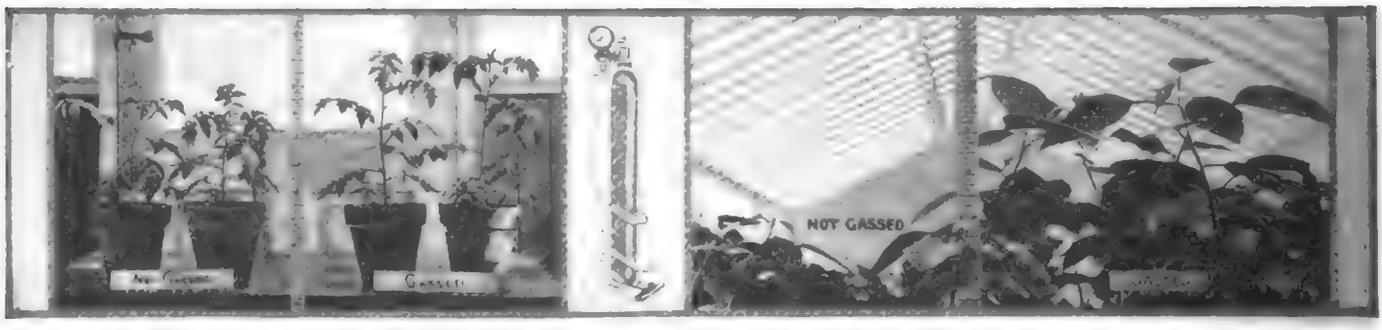



Along the bottom of each section there is a laminated core through which extend copper rods which are connected at both sides of the core. This, similar to the armature of a "squirrel cage" induction motor, running over the top of large field magnets (12 feet long placed beneath the tracks which act as does the field in an induction motor) furnishes the only motive power for the moving platform. Alternating current at three different frequencies are supplied to the field coils.




Above is shown a cross-section plan of the installation of the platforms, showing the placement of the magnets and rails.

# Carbon Dioxide Forces Growth of Plants




A German scientist Riedel, in studying the causes of coal formation and the amount of carbon dioxide found that by subjecting growing plants to a heavy blanket of the gas, amount of water vapors the plants' production could be increased ove two photographs is shown graphically the difference between plants of the same age and species which were gassed and those which were not submitted to the treatment. Tomato plants were used in the left picture while poinsettas are the subjects in the right one. The experiments were made with gasses drawn from smelting plants. —Dr. Albert Neuberger.

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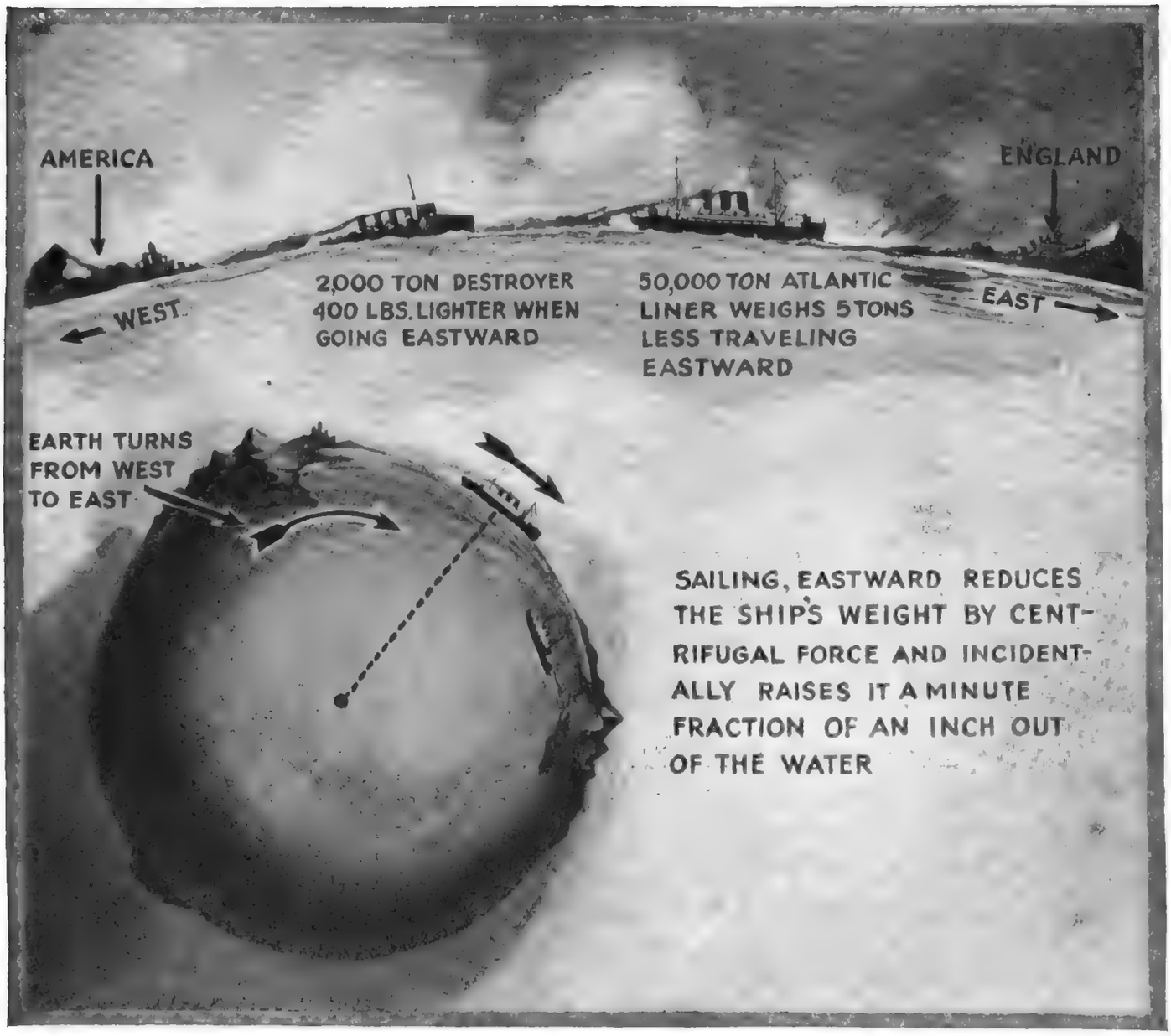
# Ships Lighter Traveling East


AMERICA
ENGLAND
WEST
EAST
2,000 TON DESTROYER 400 LBS. LIGHTER WHEN GOING EASTWARD
50,000 TON ATLANTIC LINER WEIGHS 5 TONS LESS TRAVELING EASTWARD
EARTH TURNS FROM WEST TO EAST
SAILING, EASTWARD REDUCES THE SHIP'S WEIGHT BY CENTRIFUGAL FORCE AND INCIDENTALLY RAISES IT A MINUTE FRACTION OF AN INCH OUT OF THE WATER

An English scientist, Professor W. G. Duffield, discovered, during recent experiments, that the centrifugal force of the rotation of the earth has a very appreciable effect on the weight of vessels. He ascertained that a 50,000-ton trans-Atlantic liner lost slightly more than five tons of its weight when going due east or nearly so, as against the same ship's weight for the westward journey. This difference in weight is accounted for by the fact that the centrifugal force is helped along by the revolution of the earth in the same direction. The difference in weight between the vessel in motion and the vessel stationary was not determined. The force also raised the vessel slightly out of the water.

## WORKING MODEL OF SUBMARINE

An English shipbuilding firm is marketing the three-foot submarine model shown in the above photograph for the use of inventors and students of Naval warfare. The model is fully equipped with motors, propellers, control devices, and a full set of rigging. It can be made to dive, to run just submerged, or to navigate the surface of the water. The drive as well as all work of control within the boat is performed electrically, power being furnished by a substantial battery. The boat dives with the aid of a ballast t[illegible] of the hydroplanes shown fore and aft at the sides of the boat. By referring to [illegible] right the method of operation of these hydroplanes will be understood.

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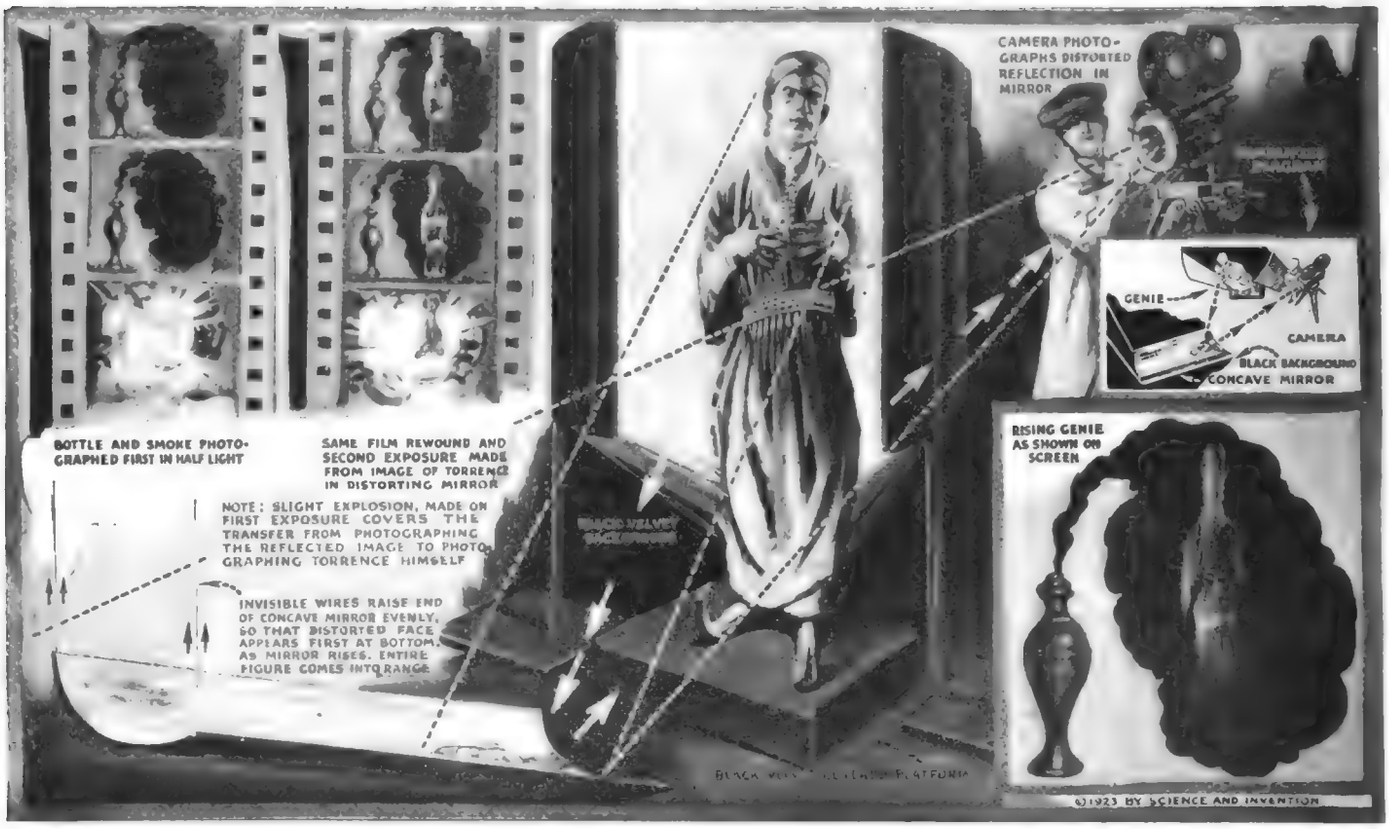
# Movie Genii from Bottle

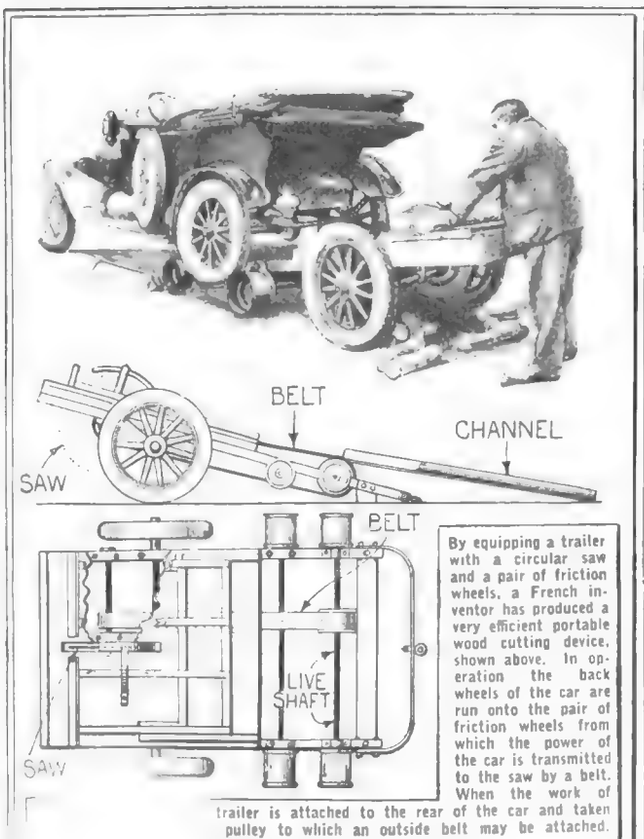
**Double Exposure Brings Human Figure from Small Bottle.**

BY PHIL GERSDORF

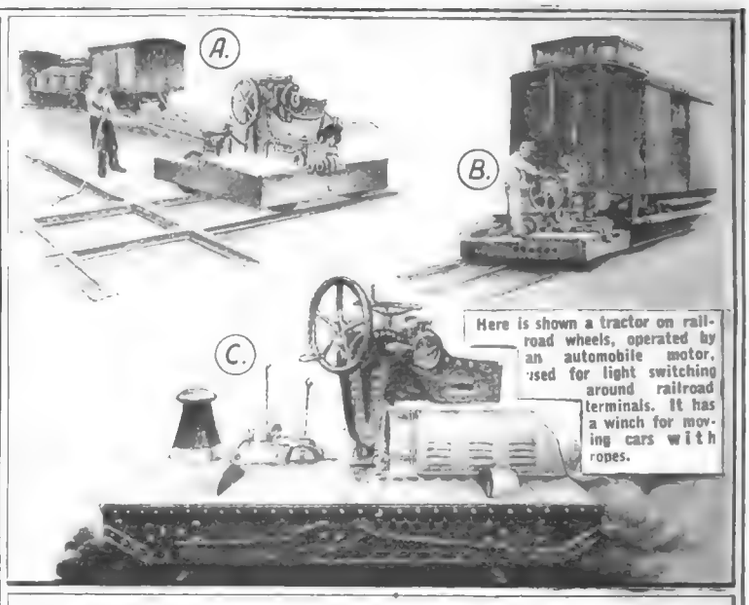

CAMERA PHOTOGRAPHS DISTORTED REFLECTION IN MIRROR
GENIE
CAMERA
BLACK BACKGROUND
CONCAVE MIRROR
RISING GENIE AS SHOWN ON SCREEN
BOTTLE AND SMOKE PHOTOGRAPHED FIRST IN HALF LIGHT
SAME FILM REWOUND AND SECOND EXPOSURE MADE FROM IMAGE OF TORRENCE IN DISTORTING MIRROR
NOTE: SLIGHT EXPLOSION, MADE ON FIRST EXPOSURE COVERS THE TRANSFER FROM PHOTOGRAPHING THE REFLECTED IMAGE TO PHOTOGRAPHING TORRENCE HIMSELF
INVISIBLE WIRES RAISE END OF CONCAVE MIRROR EVENLY, SO THAT DISTORTED FACE APPEARS FIRST AT BOTTOM, AS MIRROR RISES. ENTIRE FIGURE COMES INTO RANGE
©1923 BY SCIENCE AND INVENTION

In filming "The Brass Bottle," the hero materialized out of a brass bottle no higher than his knee. A close-up, in half light of the bottle was taken first. Then, the hero (Ernest Torrence) was photographed on the same film through a concave mirror which gave the image an eerie effect. By beginning the picture with the mirror down and raising it, the head first appeared out of the smoke from the bottle and then the remainder of the body. The figure changed from the ghostly thing into one of flesh and blood.

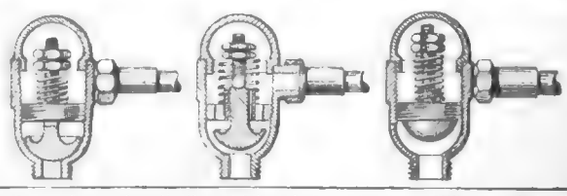
# New French Automotive Developments




By equipping a trailer with a circular saw and a pair of friction wheels, a French inventor has produced a very efficient portable wood cutting device, shown above. In operation the back wheels of the car are run onto the pair of friction wheels from which the power of the car is transmitted to the saw by a belt. When the work of trailer is attached to the rear of the car and taken pulley to which an outside belt may be attached.




Here is shown a tractor on railroad wheels, operated by an automobile motor, used for light switching around railroad terminals. It has a winch for moving cars with ropes.



Valve shown above automatically regulates air to carburetor. Left: on bottom seat for low speeds. Center: position for medium speeds. Right: for high speeds.

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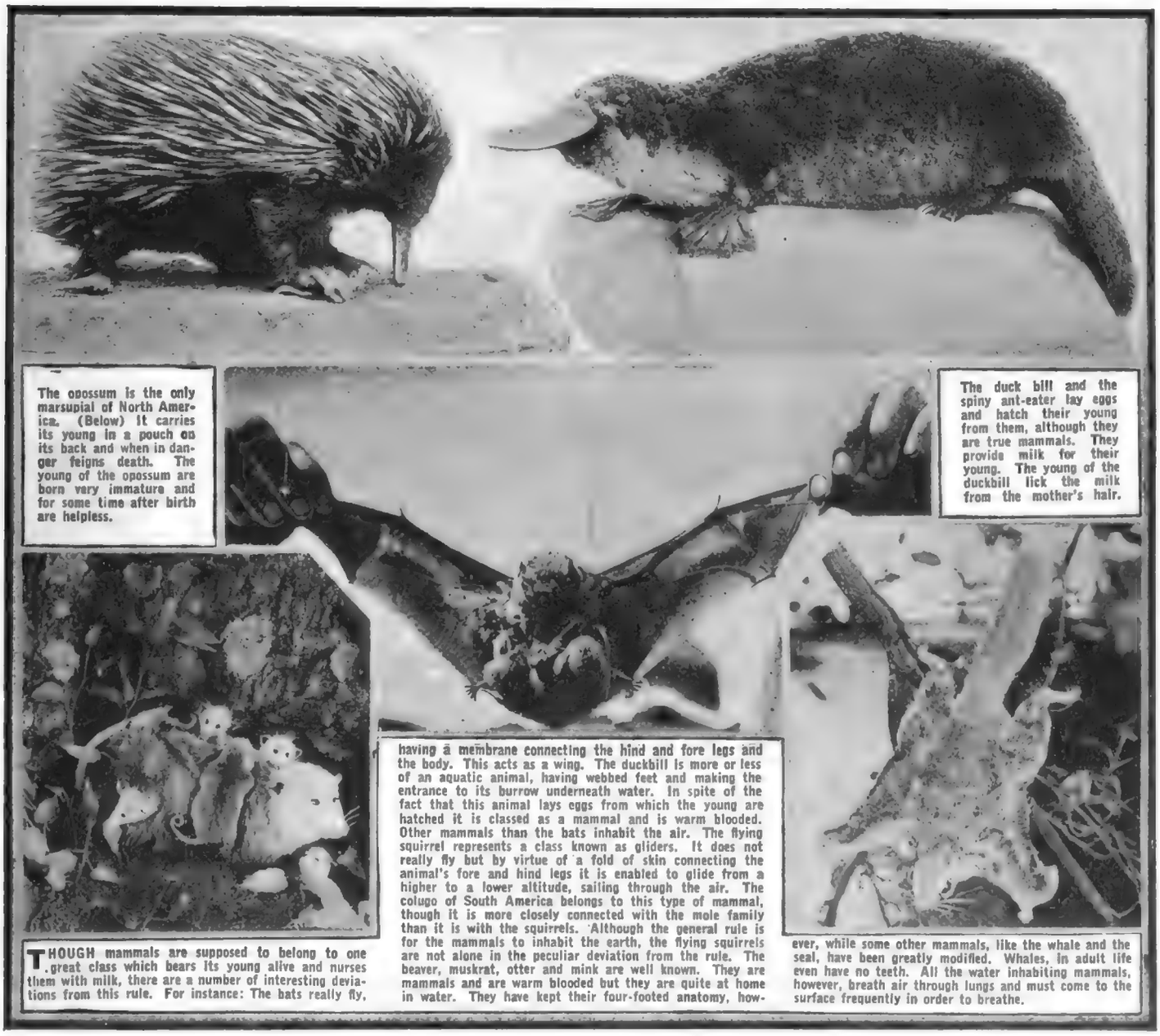
# Animals With Strange Customs

**Mammals Departing from the Regular Habits of Their Kind.**

By LAURENCE H. SNYDER.



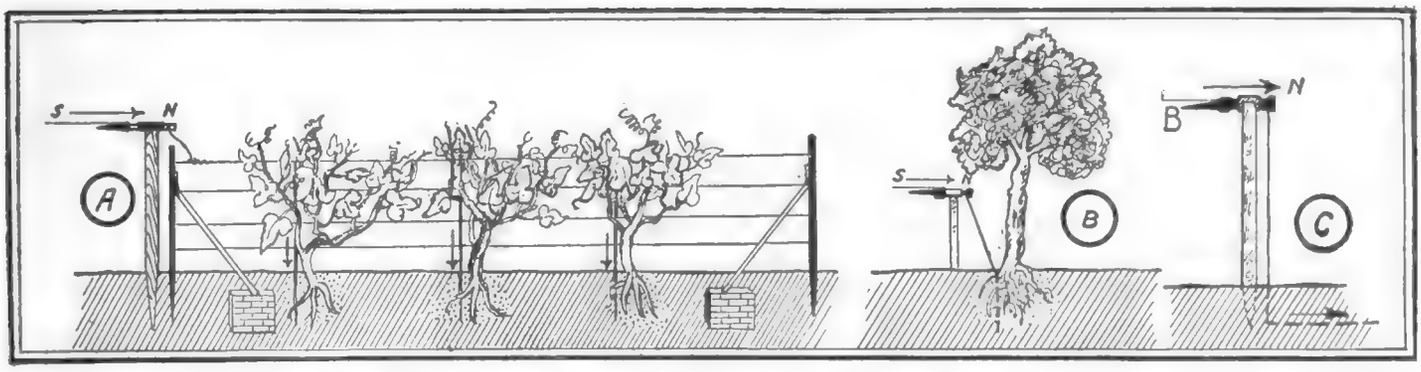
The opossum is the only marsupial of North America. (Below) it carries its young in a pouch on its back and when in danger feigns death. The young of the opossum are born very immature and for some time after birth are helpless.

The duck bill and the spiny ant-eater lay eggs and hatch their young from them, although they are true mammals. They provide milk for their young. The young of the duckbill lick the milk from the mother's hair.

THOUGH mammals are supposed to belong to one great class which bears its young alive and nurses them with milk, there are a number of interesting deviations from this rule. For instance: The bats really fly, having a membrane connecting the hind and fore legs and the body. This acts as a wing. The duckbill is more or less of an aquatic animal, having webbed feet and making the entrance to its burrow underneath water. In spite of the fact that this animal lays eggs from which the young are hatched it is classed as a mammal and is warm blooded. Other mammals than the bats inhabit the air. The flying squirrel represents a class known as gliders. It does not really fly but by virtue of a fold of skin connecting the animal's fore and hind legs it is enabled to glide from a higher to a lower altitude, sailing through the air. The colugo of South America belongs to this type of mammal, though it is more closely connected with the mole family than it is with the squirrels. Although the general rule is for the mammals to inhabit the earth, the flying squirrels are not alone in the peculiar deviation from the rule. The beaver, muskrat, otter and mink are well known. They are mammals and are warm blooded but they are quite at home in water. They have kept their four-footed anatomy, however, while some other mammals, like the whale and the seal, have been greatly modified. Whales, in adult life even have no teeth. All the water inhabiting mammals, however, breath air through lungs and must come to the surface frequently in order to breathe.

Photos Courtesy of the American Museum of Natural History, N. Y.

# A French Electro Culture Idea




The Abbey Nollet in 1749 and the Abbey Bertholon in 1783 were credited with work on the application of atmospheric electricity to plants, the latter producing some apparatus called the "Electrovegetometer." They are the first on record and were followed by others, and now a French inventor, M. Christofleau has constructed the apparatus shown in our illustrations, which he calls the "Electro-magnetic Terro-celeste," certainly an imposing name.

At two meters above the surface of the ground, a pointer is placed which is set rigorously north and south. From its unpointed end the wire is taken down to the soil, so as to reach the roots of the plants, or it may by means of a trellis be caused to first traverse their branches and leaves, and then be conducted to the soil with a ground wire for each plant. Very extensive claims are made for this apparatus.

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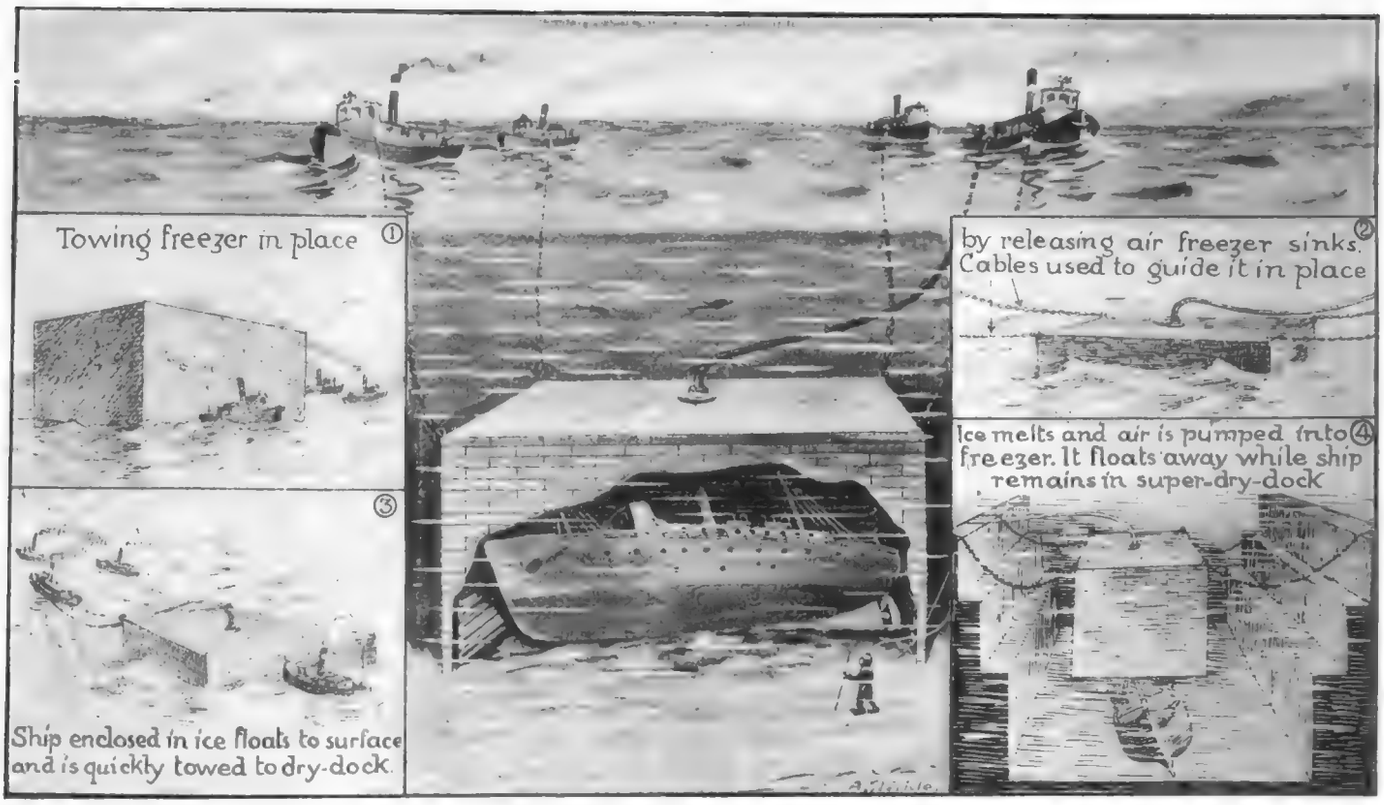
# Buoyancy of Ice to Raise Ships

**Large Cake of Ice about Sunken Hull Brings it to Surface.**

BY CHARLES MARTON.


Towing freezer in place ①
by releasing air freezer sinks. ②
Cables used to guide it in place
③
Ship enclosed in ice floats to surface and is quickly towed to dry-dock.
Ice melts and air is pumped into ④
freezer. It floats away while ship
remains in super-dry-dock

By using a large shell, vacuum lined, sinking it over a sunken ship, and then forcing a freezing mixture through cold-storage pipes inside the shell, a large mass of ice is frozen around the hull. Since the specific gravity of ice is less than water, when the freezing is completed the ice and hull will raise to the surface of the water. It is then towed to dry-dock. The steel shell is fitted with valves for sinking. Attending ships are equipped with refrigerating machinery which is connected to the coils in the caisson by tubes.

# Perspiration On Order--Movie Invention

When the cold wintry winds drive you from the street into the movie palace where a close-up shows a star perspiring freely after the terrible work of rescuing the boy hero from the [illegible] of the stoke-hold, don't envy the star, th[illegible] the pictures were actually taken next [illegible]iler head. In the close-up, re- m[illegible]ad isn't visible and that the [illegible]n made at 30 below.

Here is the way it is done. The camera is set for the close-up and the director's assistant takes a firm grip on the perspiration bulb which is filled with glycerine and water. He holds it tightly and then the director tells him to squeeze it. Then he yells "camera," and behold, in half a second the hard working actress is showing all the signs of her grinding toil. She looks as if she had spent the day sweeping the Sahara Desert. But—

Here is the harness that gives the effect, with a lot less exertion on everybody's part and even does it more effectively. The bulb, filled with glycerine and water is connected with a number of small tubes that run from the back of the actress' neck, through her hair to a point just above the forehead. When the bulb is pressed literal showers of perspiration are released and come tumbling down the actress' face.

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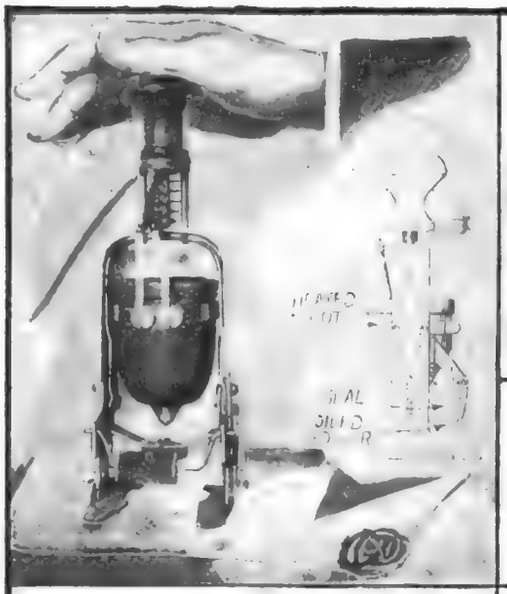
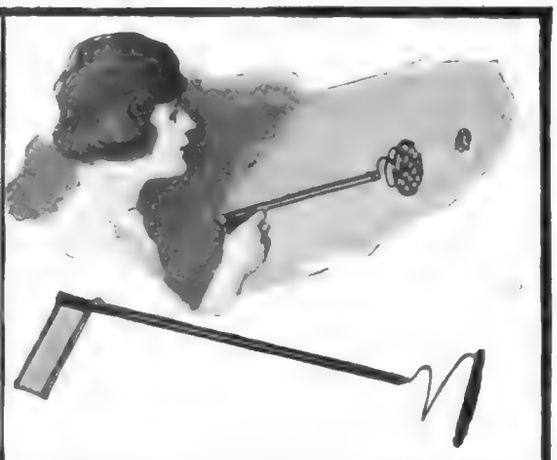
# Practical Scientific Novelties

**Modern Science Lends An Ear to Our Everyday Wants.**



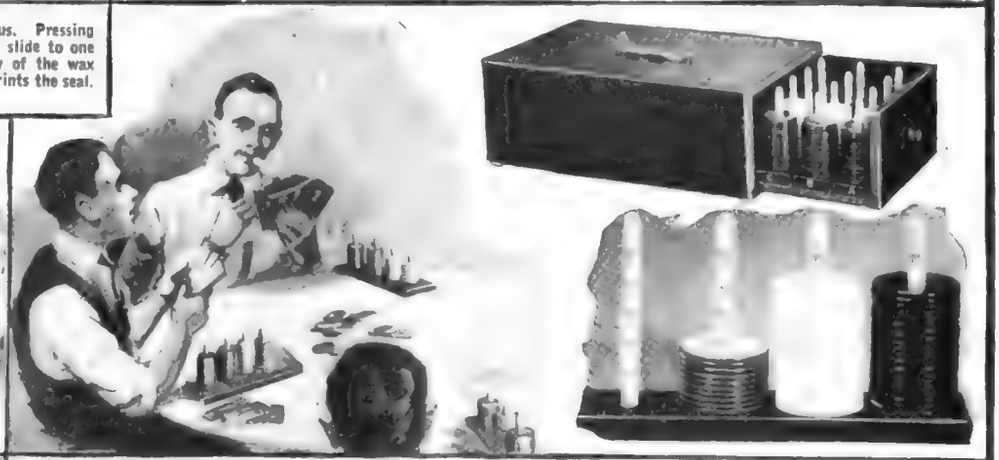
The electric sealing device shown is very ingenious. Pressing upon the handle the first time causes the seal to slide to one side brushing against the oil roller. A quantity of the wax flows upon the envelope. The second pressure imprints the seal.

The check protector shown above is one of those pocket devices which stamp the amount directly into the check, perforating the check at the same time. Each section of the check protector has a numeral upon it, which numerals are made of small needle-like points. In the upper compartment of each section is a small felt pad moistened with ink.



The fly-gun shown above will make it more interesting for the average housewife to eliminate these pests found in every household. A spring in the handle forces the swatting end forward at a rapid speed. The trigger, which fits into a notch in the tube, twists out of this notch when the gun is fired.

The socket wrench for radio outfits is a very desirable accessory to the tool outfit of any one who constructs his own radio set. The socket wrenches come in sets of threes fitting the ordinary sized nuts. They are inexpensive, and will find many uses.



The system of poker chips and banking device shown above, is made of the finest quality pyralin. There are chip racks made of mahogany for individual players, and a box holding the entire outfit on the back of which is found a banking device. A small square hole in the center of the chips allows them to be placed on pins and mounted on the chip racks. These pins are calibrated in a way which permits the player to tell at a glance the exact number of chips in his possession. The device on the back of the box is made to correspond to the letters with which each chip rack is designated. The banker inserts a peg in one of the holes opposite a letter indicating the standing of the player to whom the letter applies.

The neck-tie press shown above is made of two pieces of polished mahogany or oak, a small tapering clamp, and a small pad of felt. This felt is moistened and then the neck-tie is placed upon one of the boards, the moist felt pad on top of this, and then the second board is used as a cover, the whole being clamped together.

The ingenious knife sharpener illustrated above is made of aluminum, and two hardened steel balls, which rotate in opposite directions when the knife is drawn across them, as illustrated.

The candy container illustrated above acts just opposite to a cigar humidor. In the cover of this candy container we find a small receptacle containing a hygroscopic chemical which absorbs moisture very readily, preventing the candy from becoming sticky.

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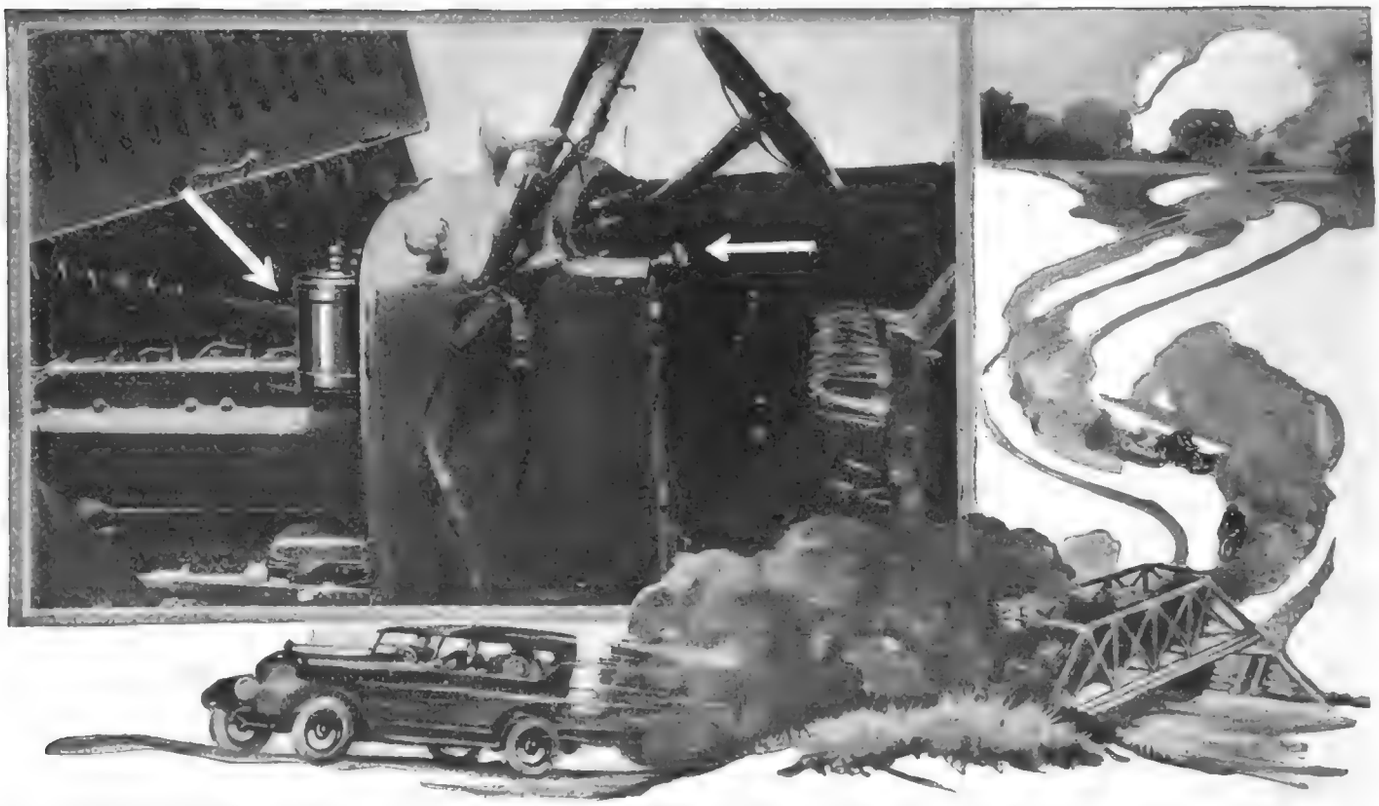
# Rum Runners Adopt Smoke Screen

**Dense Smoke Screen Hides Road from Pursuers.**



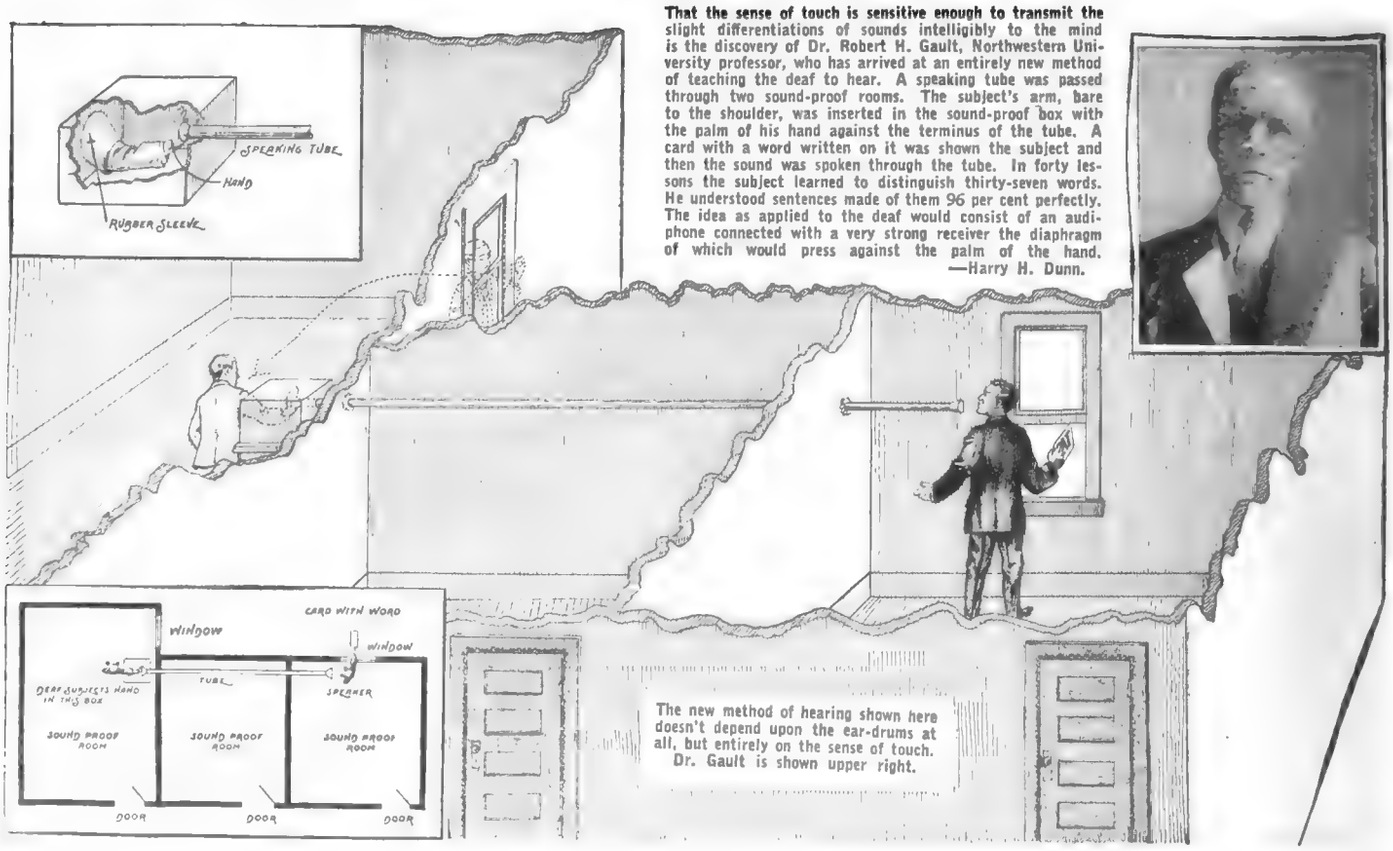
Driving 75 miles per hour, Washington, D. C., police, following alleged rum-runners, were confronted with a cloud of smoke so dense that they could not see their speedometers, last month. The road was practically obliterated for them. On capturing the car it was found that a tank of liquid, supposedly ammonia and glycerine, had been installed back of the dash of the car and the liquid led to the muffler where it was burned into smoke. The officers were unable to follow their quarry until the fluid had been burned out. The men had no liquor and so could only be charged with creating a smoke nuisance. The smoke burned nearly twelve minutes.

—George A. Luers.

# Voice Transmitted Through Arm

That the sense of touch is sensitive enough to transmit the slight differentiations of sounds intelligibly to the mind is the discovery of Dr. Robert H. Gault, Northwestern University professor, who has arrived at an entirely new method of teaching the deaf to hear. A speaking tube was passed through two sound-proof rooms. The subject's arm, bare to the shoulder, was inserted in the sound-proof box with the palm of his hand against the terminus of the tube. A card with a word written on it was shown the subject and then the sound was spoken through the tube. In forty lessons the subject learned to distinguish thirty-seven words. He understood sentences made of them 96 per cent perfectly. The idea as applied to the deaf would consist of an audiphone connected with a very strong receiver the diaphragm of which would press against the palm of the hand.

—Harry H. Dunn.




The new method of hearing shown here doesn't depend upon the ear-drums at all, but entirely on the sense of touch. Dr. Gault is shown upper right.

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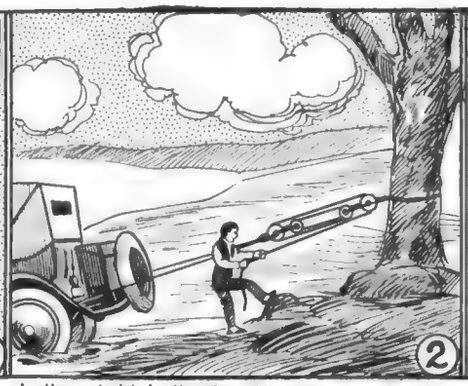
# Scientific Problems and Puzzles

## A Number of Everyday Scientific Questions That Are Interesting.

BY ERNEST K. CHAPIN, M.Sc.

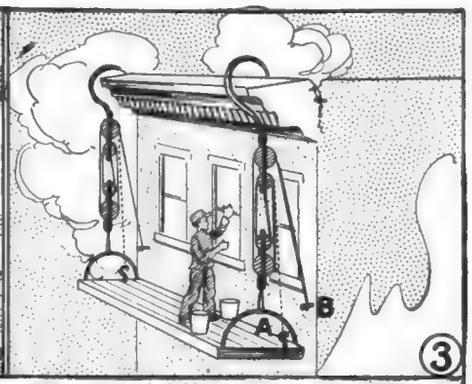
1

How many scientific errors can you see in this picture? Examine it closely. How many things would have to be changed in order to make it correct? The answer to these questions will be found on page 1051.



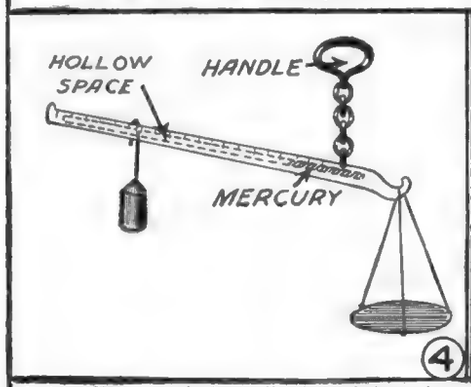
2

Is the motorist in the above illustration doing his best scientifically to get his automobile out of the mud? If not, how could he change his tactics with the block and tackle in order to work more efficiently?



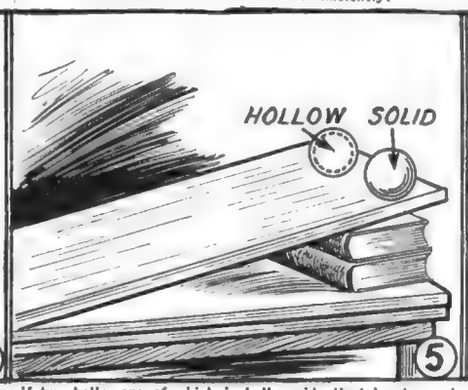

3

The painter attached his rope holding the scaffold to a peg in the wall at B instead of lashing it to the hook provided in the scaffold itself at A. Why did the cornice break when it held with the rope in the correct position?



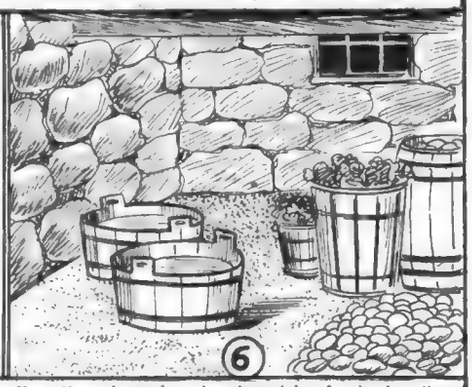

4

A clever Chinese merchant uses the steelyard shown above. It has a mercury counter-balance. If his customer insists on weighing the goods (as he usually does), will not the merchant be cheated at least half the time?



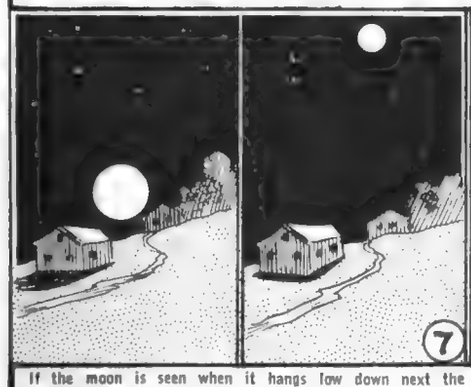

5

If two balls, one of which is hollow, identical in size and made of the same material, are released from the top of an inclined plane at the same time, which of the two will reach the foot of the plane first? Why?



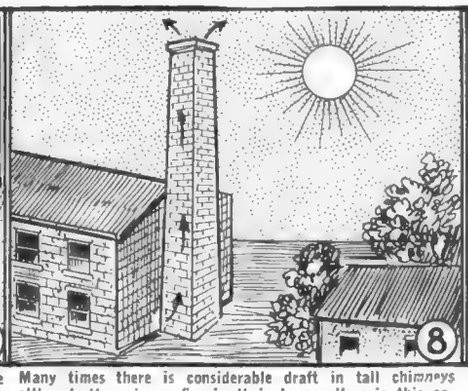
6

Many times, housewives place large tubs of water in cellars to prevent vegetables and fruit from freezing in cold weather. Will the water keep the fruit and vegetables from freezing and, if so, how?



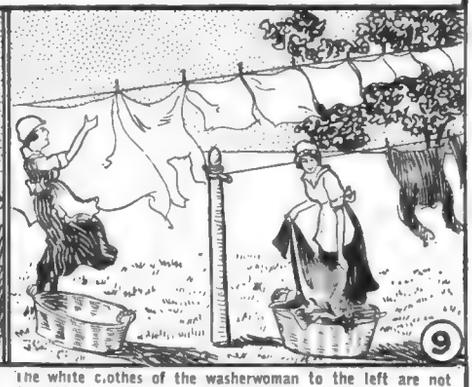
7

If the moon is seen when it hangs low down next the horizon where it seems close to trees and houses it seems much larger than when it is riding high up in the sky. Is the moon larger? If an illusion, what accounts for it?



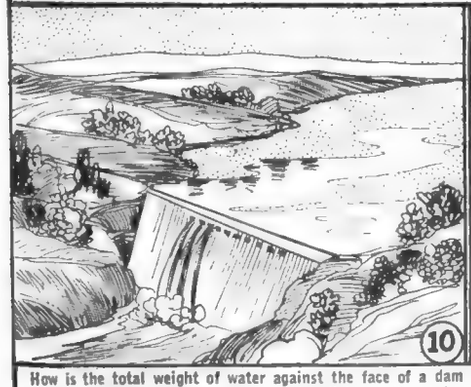
8

Many times there is considerable draft in tall chimneys although there is no fire in their base. How is this accounted for? Upon what does the establishment of this draft without fire depend?



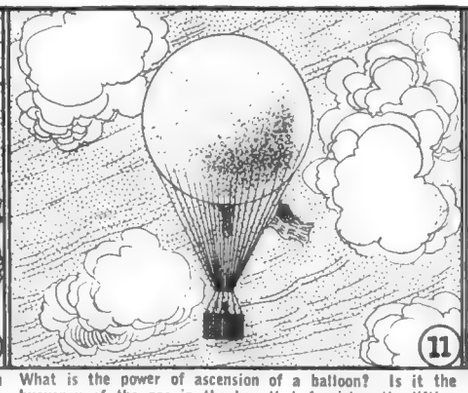
9

The white clothes of the washerwoman to the left are not dry while the dark ones of the other, hung out at the same time, are. Why did the dark clothes dry before the white ones when they were in the same temperature?



10

How is the total weight of water against the face of a dam calculated? Does it depend upon the distance the water runs back from the dam, on the velocity of the stream, the depth of the water, or what?



11

What is the power of ascension of a balloon? Is it the buoyancy of the gas in the bag that furnishes the lifting power? If so, how does it act? Why must the gas used be much lighter than air?

12

Is it the "power of suction" that causes the soda to be forced up through the straw? If not, what action takes place when the girl sips on it? (Answers on page 1051.)

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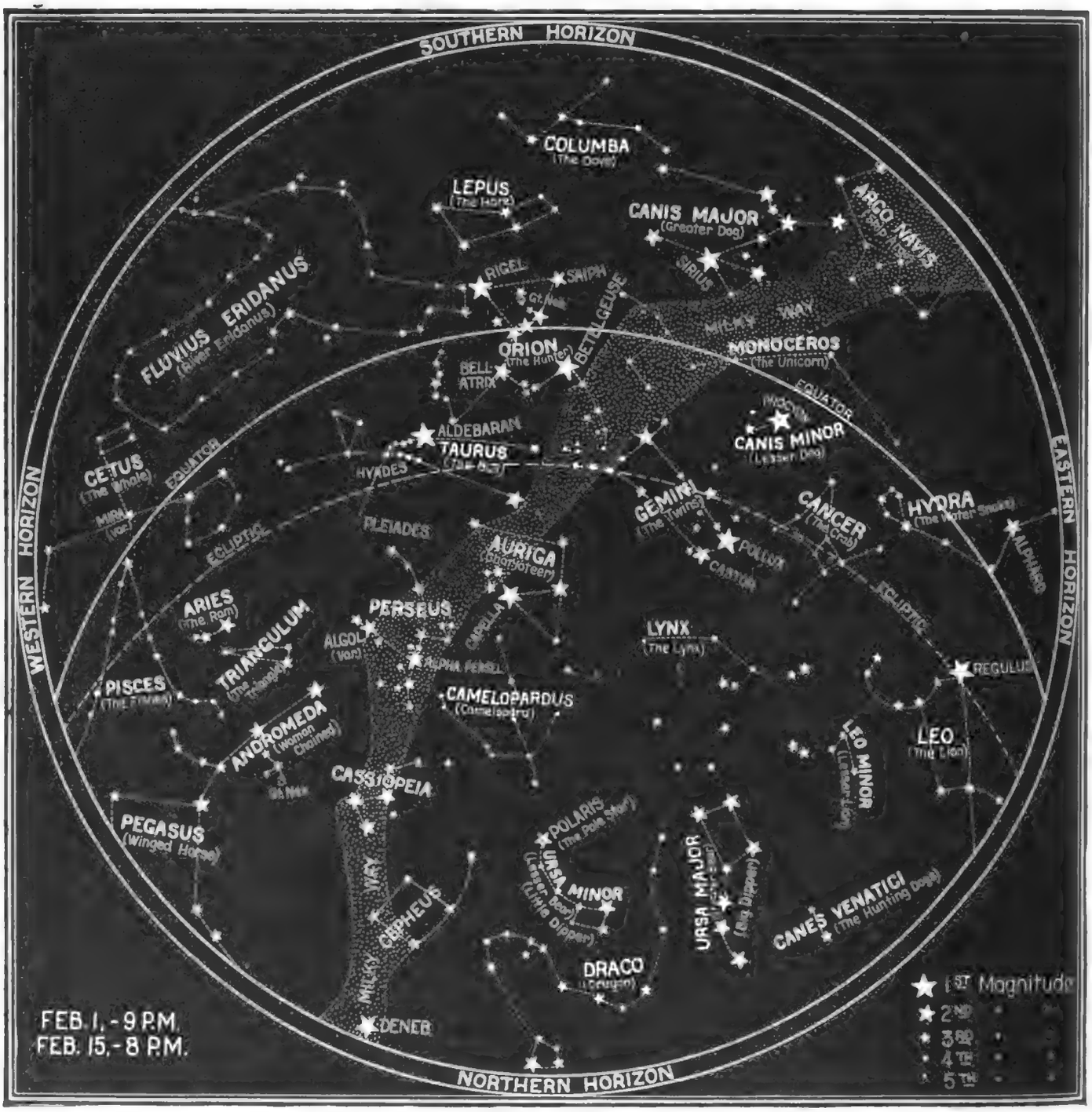
# The Heavens in February

By ISABEL M. LEWIS, M. A.
of the U. S. Naval Observatory




**Above is the star map for the month of February. If the chart is held over the head with the "Northern Horizon," north, at nine P. M., February first or eight P. M., February fifteenth the location of the stars in the heavens will coincide with their position on the map and can easily be found.**

BY nine o'clock in the evening, the first of February, or eight o'clock on the fifteenth, the magnificent constellation of Orion, the finest in the heavens, will be found a little to the west of south. No one can fail to distinguish this constellation. The three second-magnitude stars evenly spaced a degree apart in a line exactly three degrees long that form the Belt of Orion, immediately attracts the attention of anyone gazing at this part of the heavens. Then there is the huge quadrilateral that outlines the body of Orion. The Betelgeuse and blue-white Rigel are ...onally opposite corners, both first-magnitude stars, and in the other two corners are Bellatrix, in the left shoulder and Saiph in the right knee, stars of the second magnitude. Just below the Belt in the Sword of Orion is the Great Orion Nebula, the finest object of its kind in the heavens. The distance of the nebula and its associated stars is estimated to be approximately six hundred light years.

To the east and southeast of Orion and now well up above the horizon will be seen the two dogs that follow at the heels of Orion. Canis Major, The Greater Dog, and Canis Minor, The Lesser Dog. Sirius in Canis Major, is by far the brightest of all the stars and is at a distance of only eight and eight-tenths light years from the earth. Next to Alpha Centauri it is the nearest of all the first-magnitude stars. Canopus the second brightest star in the heavens lies about thirty-five degrees nearly due south of Sirius and cannot be seen north of the thirty-eighth parallel of latitude. It is so distant that its parallax cannot be determined by the trigonometric method. It must be at least several hundred light years from the earth, perhaps much more than this, so intrinsically it is one of the most luminous stars in the heavens, not de-

(*Continued on page* 1039)

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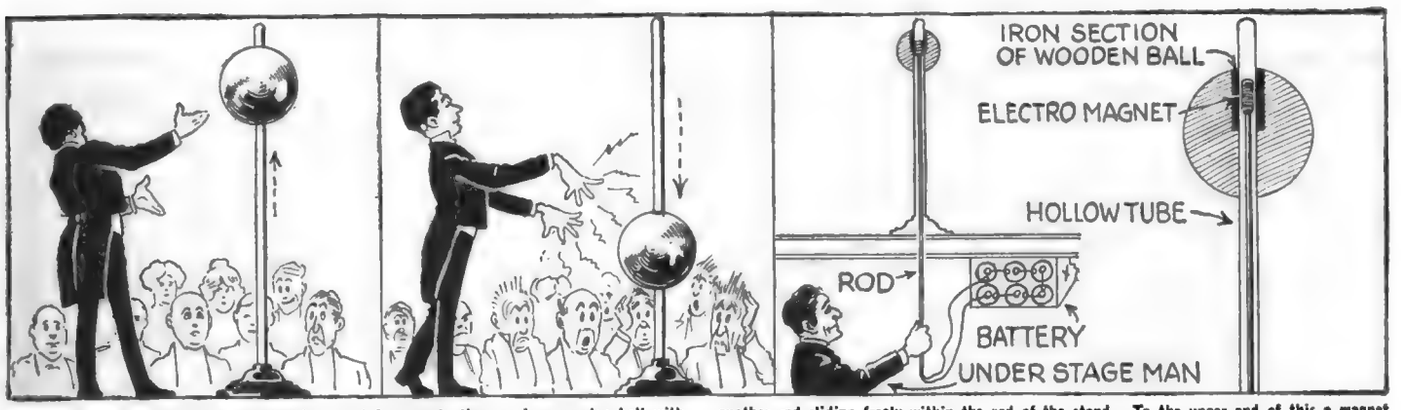
# Magic for Everybody

BY PROF. JOSEPH DUNNINGER.

NO. 11 OF A SERIES

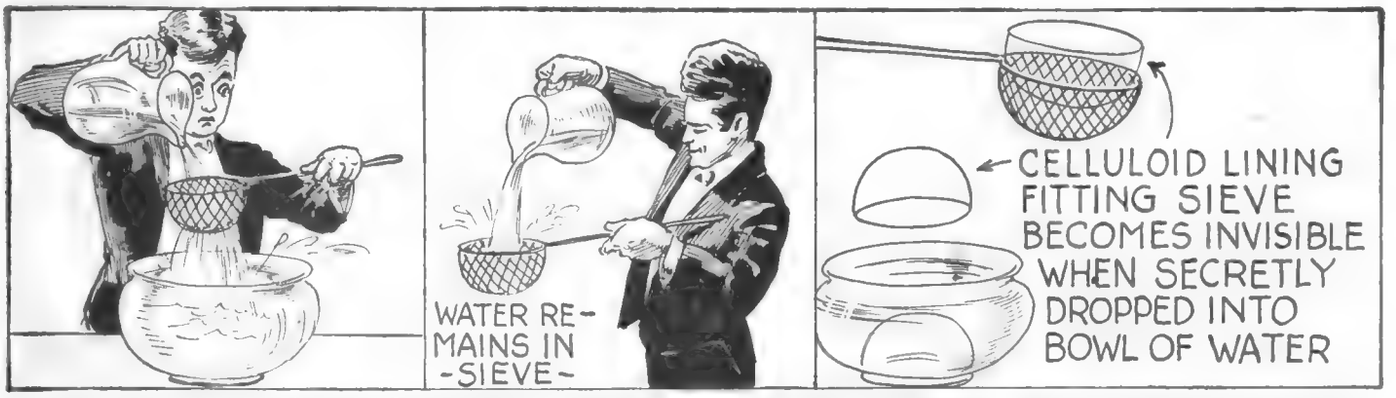



A hollow brass rod secured to a stand is passed for examination, as is a wooden ball with a hole through it, allowing it to move freely on the rod. At the word of command, the ball can be made to rise or fall on the rod. An assistant below the stage is supplied with another rod sliding freely within the rod of the stand. To the upper end of this a magnet is secured which receives its energy from the batteries beneath the stage floor. The understage man causes the ball to rise and fall by sliding the rod up and down.

SPECTATOR DROPS RING INTO BOWL OF WATER
MAGICIAN PICKS OUT RING WITH BARE HAND.
HIS HAND AS DRY AS BEFORE THE OPERATION
THE SECRET LYCOPODIUM DUSTED ON SURFACE OF WATER

A polite spectator drops a ring into a fish bowl full of water. The magician washes and dries his hands thoroughly to prove that they are unprepared, and then plunges his hand into the water and withdraws the ring. To the spectator's astonishment, his hands are perfectly dry. Use lycopodium powder, sprinkled upon the water prior to the trick.

A ruler is placed on the edge of the table. A glass of water is balanced on the free end, while the other is held with a few books. The books are now removed, but the glass and rule still maintain their positions. Finally the rule is also taken away, but the glass remains suspended in mid-air. For holding the rule on the table, the tack in the table and the slot in the base of the rule are very effective. In suspending the glass in mid-air a thin thread is used. This drops off when the glass is passed out for examination.




The performer pours water into a sieve and it flows through freely. He repeats the operation, but this time the water remains in the sieve. The water is then poured out by tipping the sieve as though it were a dipper, and the sieve passed for examination. The performer slipped the invisible celluloid lining out of the sieve when he

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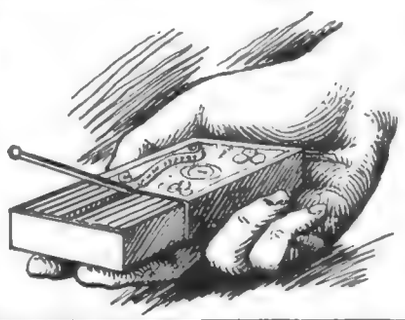
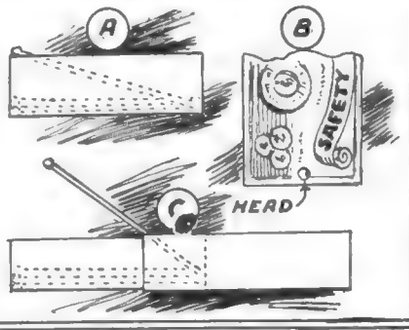
# Scientific Match Box Puzzles

**Interesting Tricks Performed With the Aid of Ordinary Matches.**

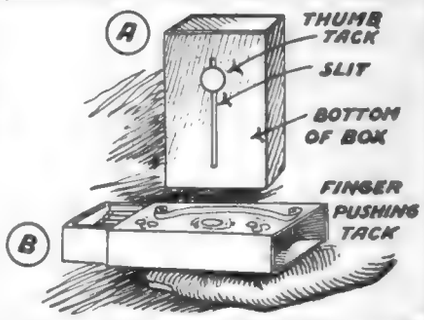
BY WALTER B. GIBSON



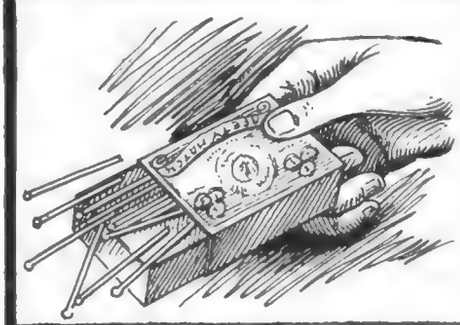
The obliging match box. An ordinary safety match box is held in the right hand, and with no apparent motion of the hand, the box slowly opens and one match raises its head. The left hand removes the match and the drawer automatically slides back.



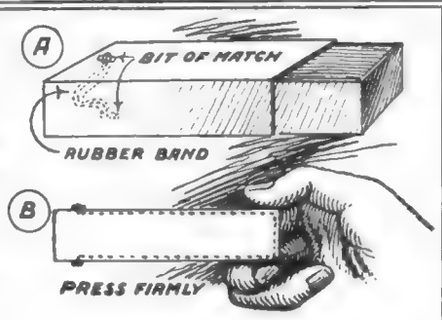

A match raises from the box. A tiny hole is cut in the top of the match box near one end, and with the drawer closed, a match is pushed in through the hole until only the head protrudes. Figs. A, B and C indicate the position of the match.



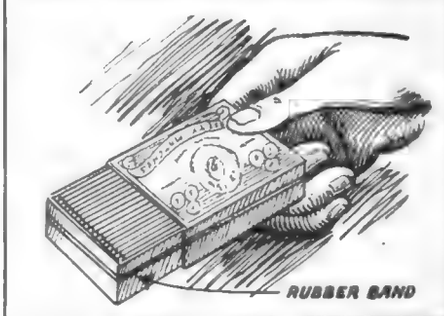

A slot is cut lengthwise in the bottom of the cover of the match box, and at one end of this a thumb tack is inserted into the drawer. Pushing on the thumb tack with the forefinger held underneath the match box, causes the drawer to slide out.



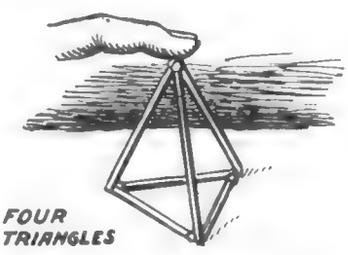
Another more startling automatic match box is shown above. With the query "Have a match?" the drawer of the box slides open and a dozen matches fly out at the surprised spectator. The match box is held in one hand when the trick is performed by the method shown.



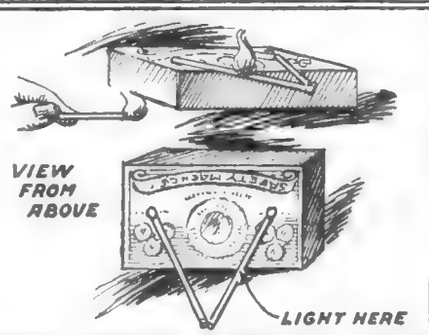

A rubber band is passed from cover to cover of the match box, and held in place by bits of matches to which the rubber band has been fastened. As shown at A the match box acts in the ordinary manner. At B it forms a veritable gun.



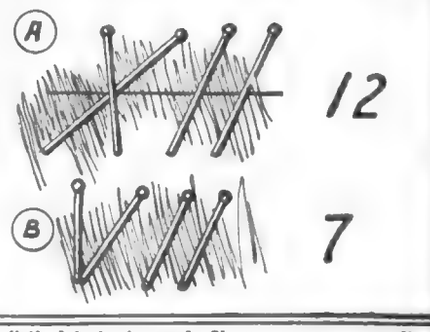

An open box of matches is held out to some one and just as he reaches for them, the match box closes. A rubber band is slipped around the box. Press firmly at the rear to hold it open; when pressure is released the box slides closed.



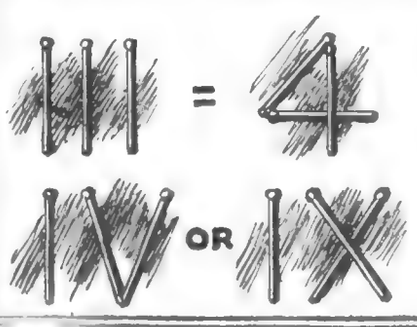

Lay six matches on the table and challenge anyone to form four equilateral triangles from the six matches. None of the matches may be broken. The problem seems impossible, but the drawing shows how it can be done.



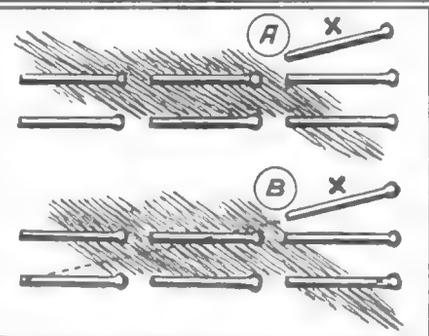

Lay two matches as shown, and light one of them. Then ask how many seconds it will take for the burning match to ignite its companion. Answer is never, because the match burns and curls away from the other.



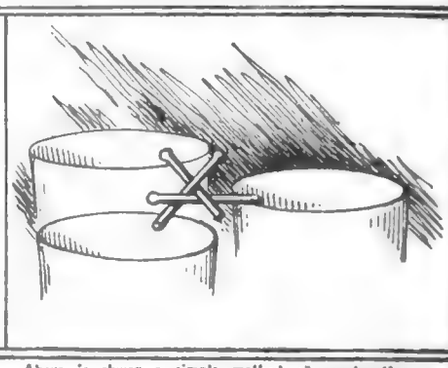

Half of twelve is seven! Oh, yes, you can prove it. Simply lay matches on the table so as to indicate the Roman numeral 12 and then separate them as shown in the straight line, taking away exactly half of each figure. The result is seven.




...make four matches out of three matches ...ing any of them? The answer is very ...the three matches to form the figure ... or five Roman figure IV.




Lay seven matches as shown, and ask where X points. Most will say it points to the head of the first match at the bottom. But it points to the lower end, as is proved with a ruler.



Above is shwon a simple method of constructing a bridge which will connect three drinking glasses. The head of each match is to rest on one of the glasses, but the other end must not touch a glass.

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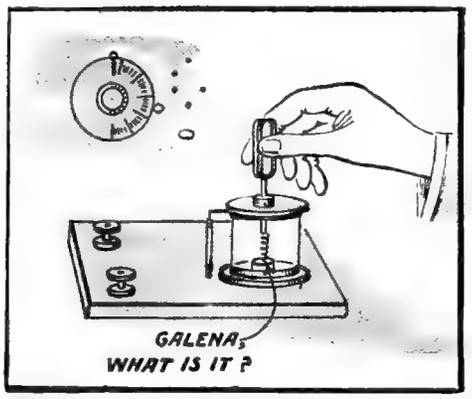
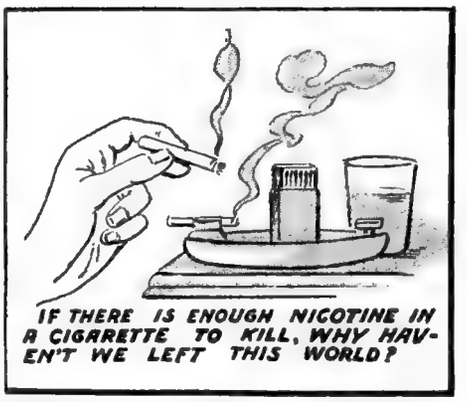
# Everyday Chemistry

## Some Kinks and Compounds in Everyday Use Explained.

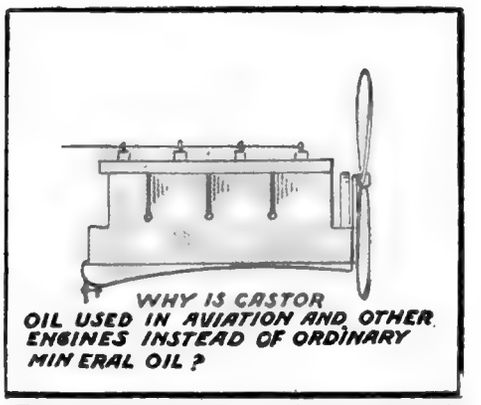
BY RAYMOND B. WAILES



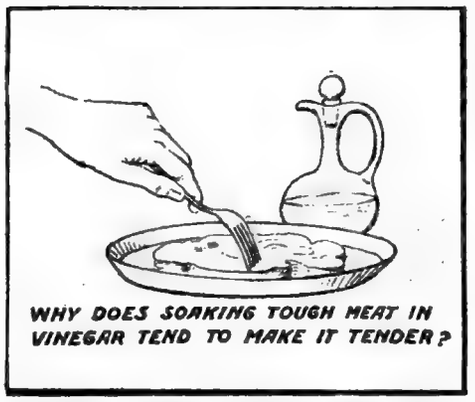

Galena is native lead sulphide having the formula PbS. It occurs sometimes in massive cubic or octahedral crystals. It is the principal ore of lead, often containing comparatively large qantities of silver.



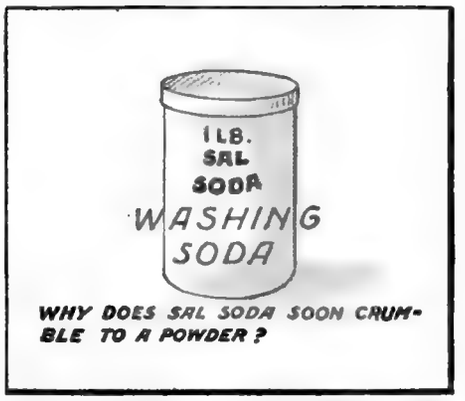

The reason that the nicotine in a cigarette has very little effect on the smoker is because most of it is burnt up. If the nicotine were extracted and administered internally, it would be fatal.



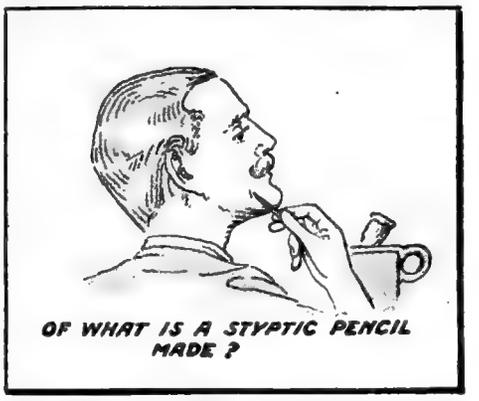

The reason that castor oil is used in aviation engines in preference to ordinary mineral oils, is because this oil does not mix with gasoline, and consequently is not thinned down, thus maintaining its lubricating quality.



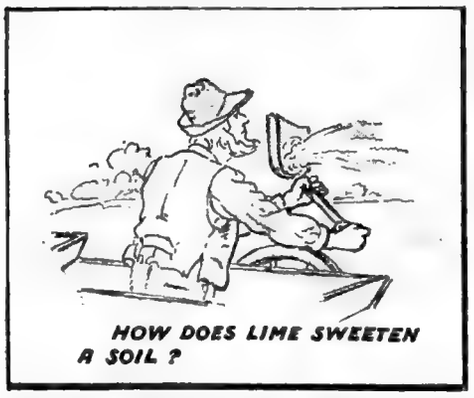

Soaking meat in vinegar tends to make it tender because the collagen present in the meat swells. By continuous boiling of the meat, this collagen is converted into gelatin. Collagen is a proteid.



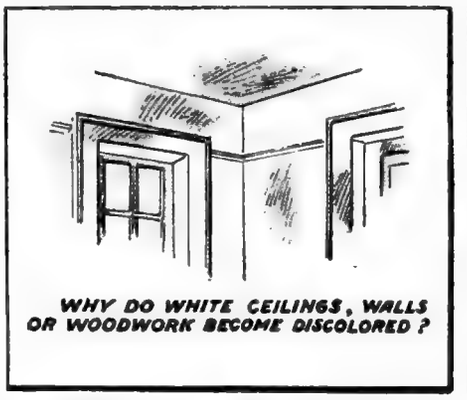

Sal soda and washing soda—the same substances—contain water of crystallization. When this water is driven out by heat, the crystal crumbles to a powder. The water causes the salt to maintain its crystalline form.



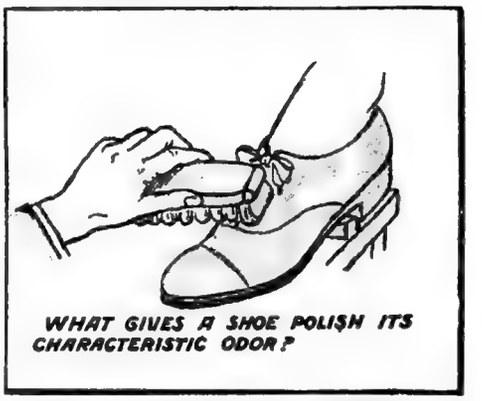

The ordinary styptic pencil is made of seventy-five per cent of alum and twenty-five per cent saltpeter. Its astringent properties cause the edges of the wound to constrict, limiting the flow of blood.



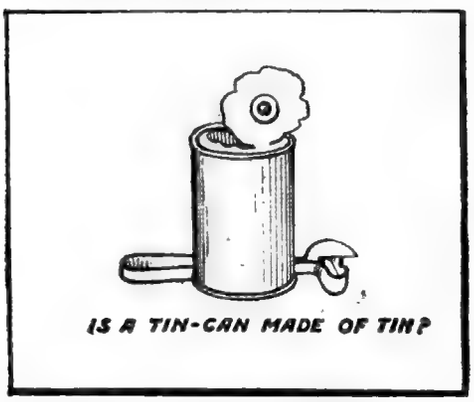

Lime when sprinkled on the soil, although not actually sweetening the soil, neutralizes the acids of the soil and thus removes the sourness. Such treatment facilitates the raising of greater crops.



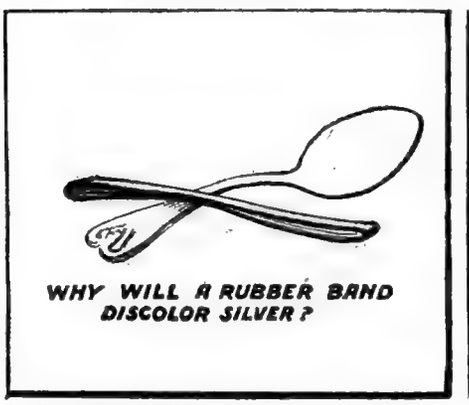

If a special white paint is used, white walls will not discolor in impure air charged with sulphuretted hydrogen. Sometimes zinc white is used as a substitute for white lead.



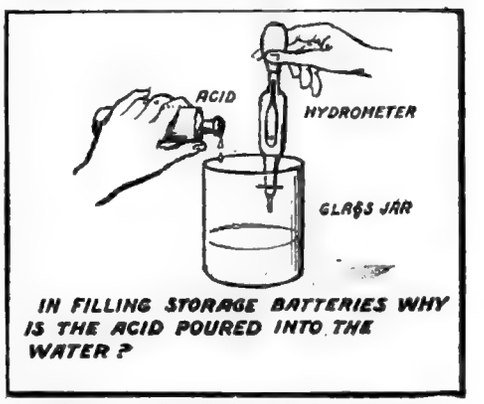

The odor of a shoe polish is due to nitro-benzene. This dye base is used in large quantities in the preparation of aniline. The liquid is a pale yellow fluid and is produced by the action of nitric acid on benzene.




A tin can is not made entirely of tin. Sheet iron forms the base and is coated with tin. This tinning process prevents the iron from rusting. The use of tin entirely would make the cans very expensive.




A silver spoon is discolored when a rubber band is placed upon it because of the sulphur in the rubber band. Sulphur is used in the vulcanizing process; it combines with the silver forming silver sulphide.




In making a quantity of electrolyte for a storage battery, acid shoud be poured into the water because the water dissipates the heat of solution. Reversing the process may result disastrously for the mixer.

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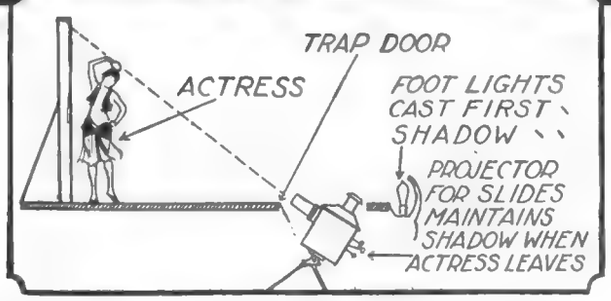
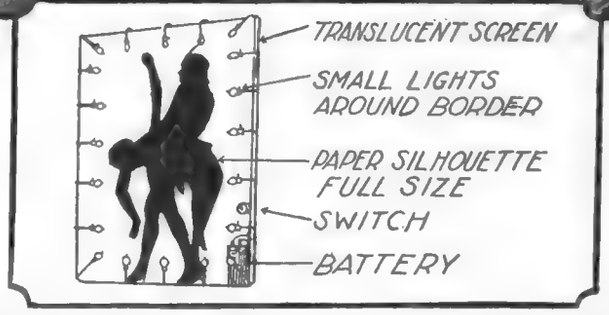
# THE CONSTRUCTOR

## Mysterious Shadow Illusion

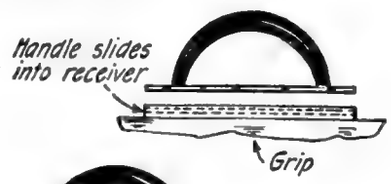
**Novel Stage Effect Gained With the Aid of Lighting Plan.**

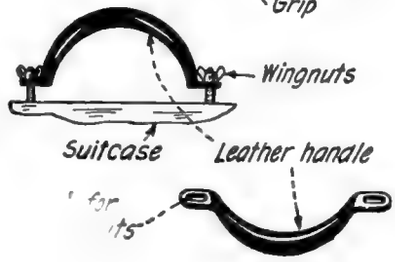


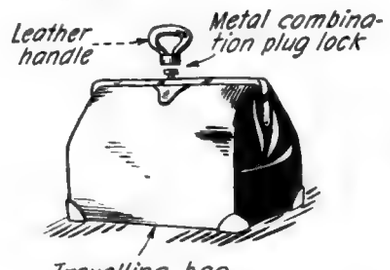

In the illustration above a large silhouette is seen on a screen. The lights are dimmed and the actress steps out from behind the screen while the shadow still remains. The screen is removed from the stage with the shadow still in place. The illusion is gained by using a projector in connection with the concentrated silhouetting lights in front of the screen. The method is illustrated in the sketch. The actress poses in the predetermined position. The audience sees her shadow. The lights fade but the silhouette remains, thanks to the projector which casts the same silhouette of the actress which is on the slide upon the screen. In the last act the man and girl carry the screen with their shadows still in place off the stage. Two life-sized silhouettes are back of the screen, illuminated by small lights, as shown. —L. J. Smith.

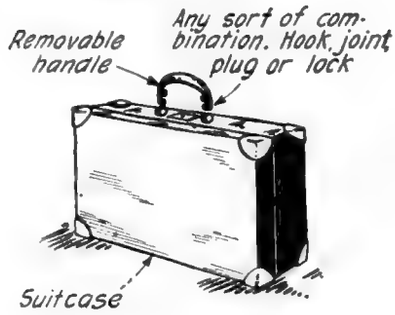
## Perfect Safety for the Hand Luggage



Perfect safety for the hand luggage is guaranteed by the simple device illustrated here. By a simple expedient of using removable handles, all danger of lost or stolen luggage is removed. As shown at the left, the handles can be made in various shapes and forms. At the right is shown a more complicated arrangement where the handles are fitted with locking devices, so that only the handle belonging to the bag may be used with it. Above is shown a handle equipped with a combination lock which not only serves to carry the bag, but also to lock it. It is also suggested that identification numbers be placed on the bag and on the handle, so that the owner at check stands or similar storage places, will have only to present his handle to redeem his bag, thus doing away with the annoyance of carrying checks. —Leonard J. Edick.

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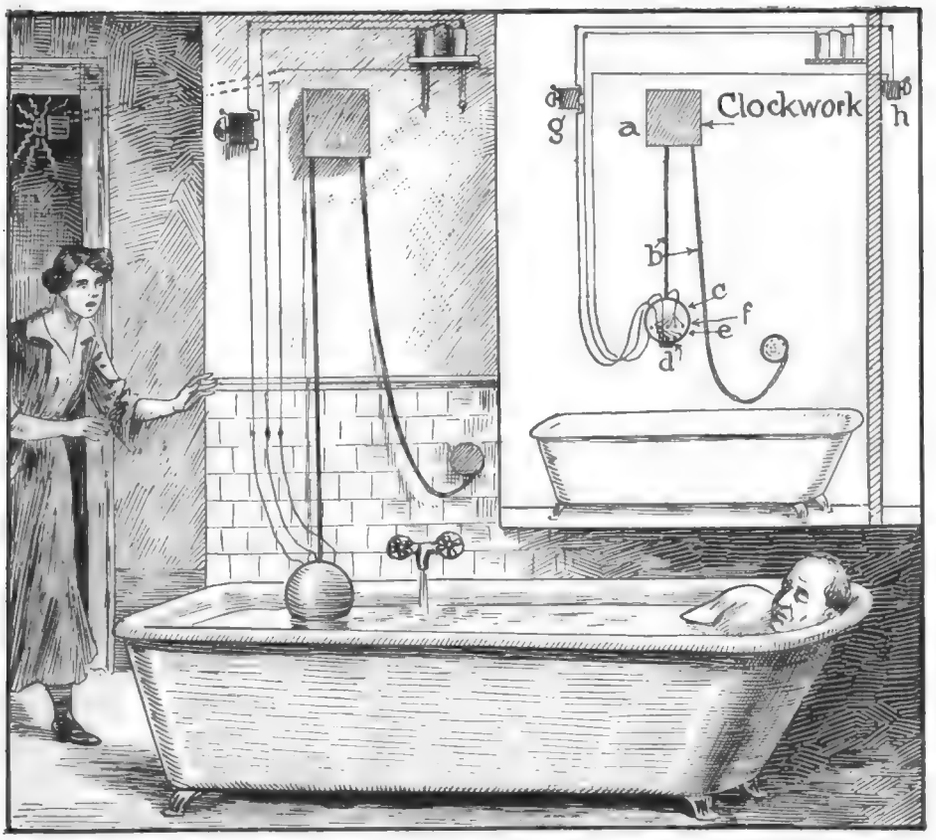
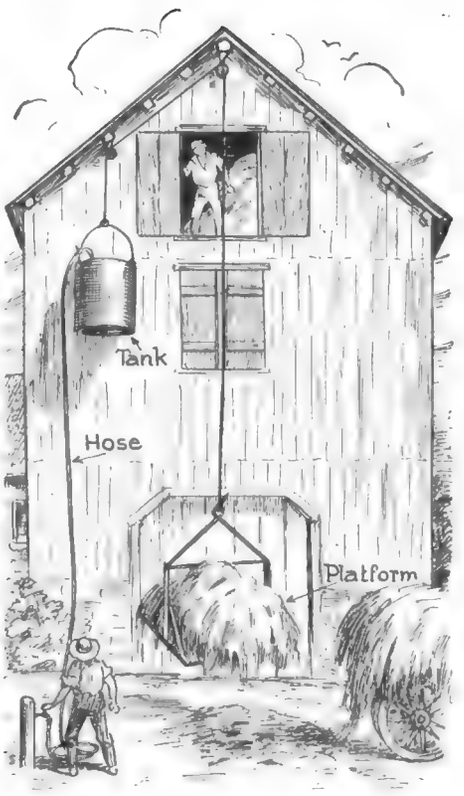
# Alarm for Bath




Many accidents are caused by persons falling asleep or being struck with a sudden illness while in the bathtub. Such mishaps may be easily avoided by applying an apparatus such as the one shown in the above illustration. The ball housing the contacts is allowed to gradually sink to the surface of the water by clock-work. If nothing is amiss the bather pulls the ball up to its first position. If something has happened to the bather the ball sinks into the water, ringing the bell in the bathroom; if it is not pulled up, it sinks further, ringing a bell outside the bathroom.

—Dr. Albert Neuburger.

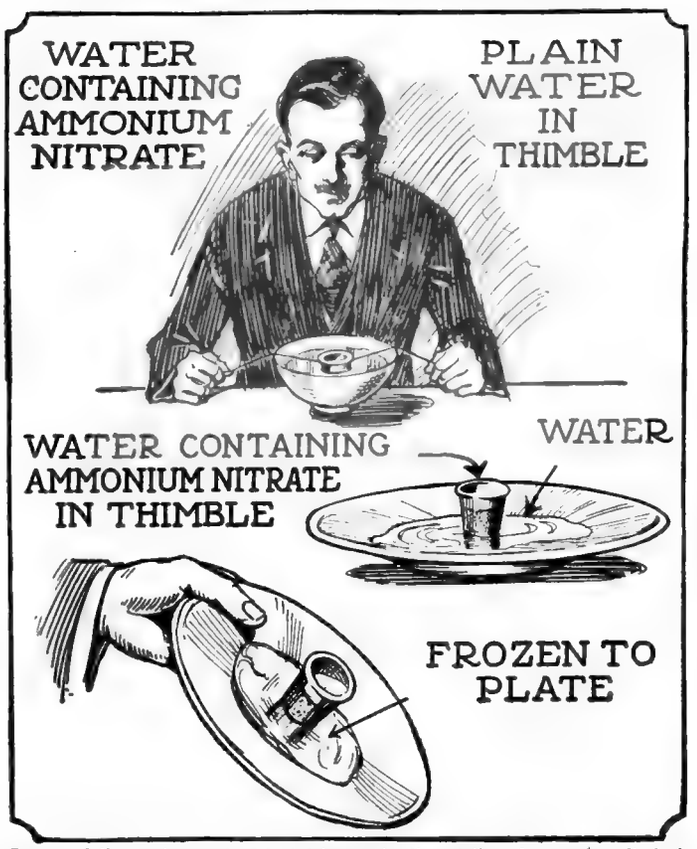
# Farm Elevator




Where a supply of water is available, a serviceable elevator for farm work may be easily constructed as shown above. A length of garden hose fills the large container with water, over-balancing the weight of the load, and carrying it up. The water is then turned out of the container, and the elevator is lowered for another loading.

—Dale R. Van Horn.

# Thimble Ice Factory




Because of the great amount of heat taken up by the solution of ammonium-nitrate in water, ice is made in a saucer on the hottest day by simply placing a thimble full of the salt dissolved in water in the center of a saucer containing a little water.

—Dr. Albert Neuburger.

# Simple Shower Bath

By drilling a few holes in the hose connection attached to the bathroom faucet, and inserting a stopper, as shown above, a very serviceable shower bath attachment is made. A string directs the spray.

—Harold Jackson.

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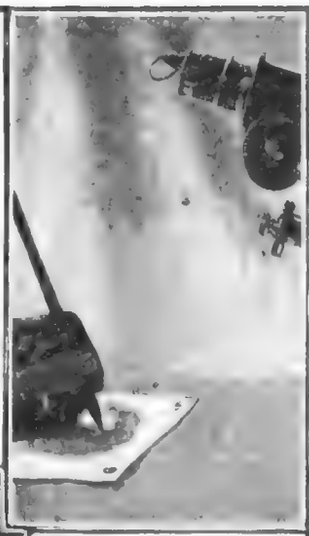
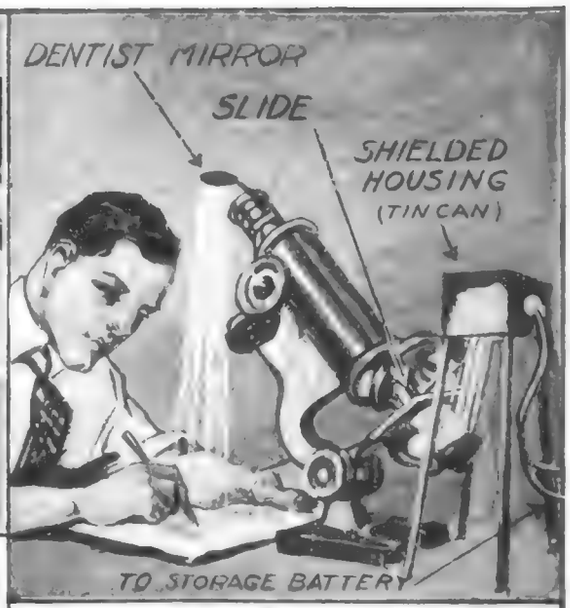
# Sketching Attachment for Microscope

MORE often than not the amateur chemist is unable to look at his subject through a microscope with one eye and with the other sketch the subject as it appears magnified. With the aid of the very simple device shown here it is possible to project the image directly on to a piece of white paper, making it only necessary for the observer to follow the lines and images cast on the paper with his pencil, in order to have a perfect reproduction of the specimen. The whole appliance consists of a paper collar and a dentist's mirror.





The first step in preparing this simple projecting device is to form the paper collar, which fits over the eye-piece of the microscope in order that the projecting mirror may be held securely in place after the final adjustments for focus and light have been made with the mirror removed. This may be made by cutting strips from ordinary writing paper and wrapping them about the eye-piece, taking care to hold each turn securely in place by a small drop of glue. A small dentist's mirror is then procured from a medical supply house. These may be obtained for small sums, usually about sixty cents. One should be selected with a small diameter handle, several inches long, as this handle must form the support with which the mirror is attached to the microscope. With the collar completed and in place, it should be measured and a loop made in the handle of the mirror slightly smaller in diameter than the measurement of the collar, so that when the loop is slipped over the collar it will fit snugly. The mirror is then placed over the collar, as shown in the above illustration. Directly above may be seen the way the completed projection appliance appears when it is finished and in place on the microscope. The angle of the mirror should be near 45 degrees.

If a small light furnished by an automobile bulb and housed as shown above is used to project the light on the specimen under observation, results will be much more satisfactory than those obtained by the use of plain sunlight or the regular illumination of the room where the observations are being made. It is only necessary to place a small socket with the light bulb in a tin can and then support the whole on legs at such a height that the light itself will be above the reflecting mirror at the bottom of the microscope. The aperture in the bottom of the can through which the light falls on the reflecting mirror, may be so made that practically all of the light is used by the microscope. If this arrangement is used, and the remainder of the room darkened, the reflections will be clear cut and the details will all be brought out with a surprising perfection.

—P. Cedric Wenger.

# Method for Making Concrete Basins

Many uses present themselves for concrete containers or basins but few of them are used by the layman and amateur on account of the difficulties connected with making the forms in which they must be cast. By the method shown here, using two ordinary kitchen pans of different sizes basins of almost any capacity may easily be made with minimum work. The outside pan must be several inches higher than the one used inside to allow for the thickness of the base. A mixture of one part cement and three parts finely screened sand will be found to be most practicable in the manufacture of these dishes. The inside pan is placed carefully concentric with the outer pan and the concrete is mixed to a consistency which will allow its being puddled. The cast should be allowed to dry three days before it is put into use. The finished basin should be painted with cement and water.

—Dale R. Van Horn.

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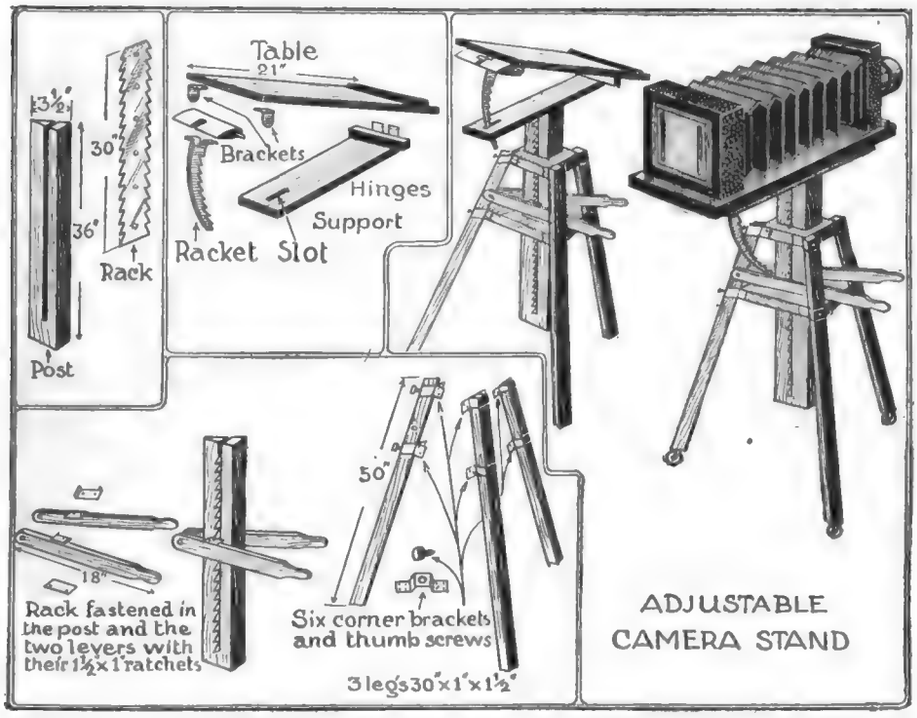
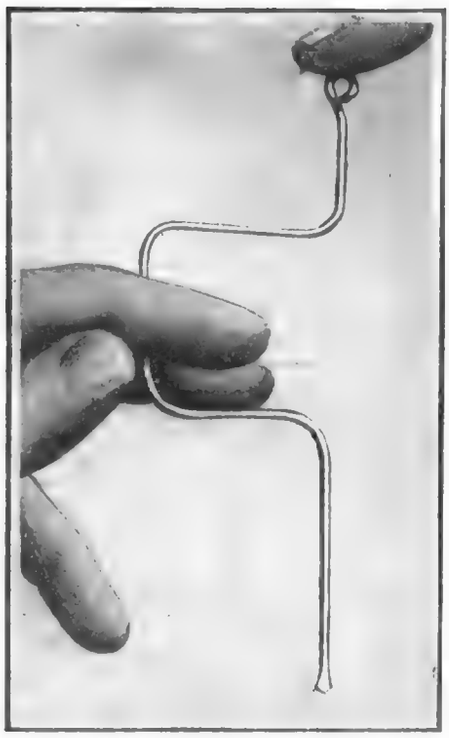
# Serviceable Camera Stand




The amateur with a long bellows camera will experience no little difficulty in focusing close-ups on the ordinary tripod or well known stack of books. Just an ordinary camera adequately mounted is half the battle. The sketches illustrate a camera stand constructed by the author which meets all requirements. The sheet iron corner brackets are bent to fit around the legs, which may be easily inserted and are held in place by six thumbscrews. The top or table is 11 by 21 inches, adapting the stand to all sizes of cameras. The camera is raised and lowered vertically by the two levers and tilted by a rack as shown. The triangular shaped vertical post, which has 3½ inch faces and is 36 inches long, is slotted with a rip-saw to receive the rack. This rack, cut out with tin-snips from sheet iron, is 30 inches long. The table is hinged to its support. This support, which is screwed to the top of the post, is slotted to receive the tilting rack. This rack, cut from sheet iron, is mounted on a block of wood which is pivoted with brackets at the sides as shown.

—J. T. Garver.

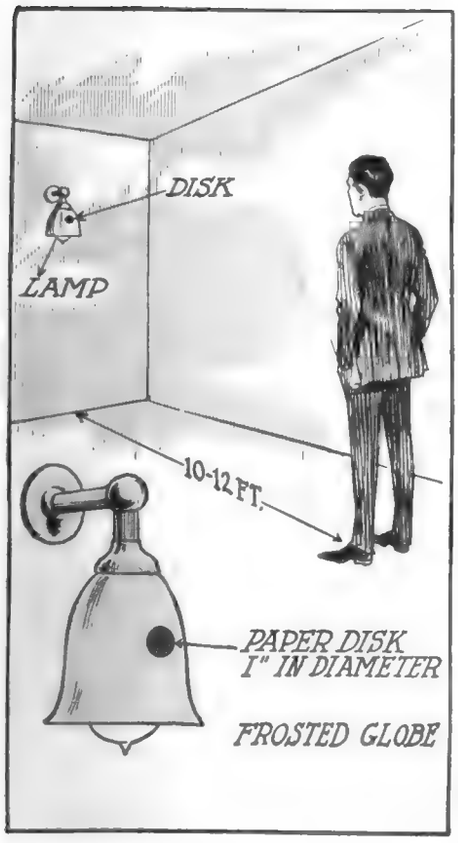
# Small Drill



The photograph shows how a small drill may be made in an emergency. The point, of course, must be filed drill-fashion and then tempered. The bent corners should also be tempered unless the wire is very thick and is not in danger of bending under the pressure needed.

—V. B. Rickey.

# AN INTERESTING ILLUSION

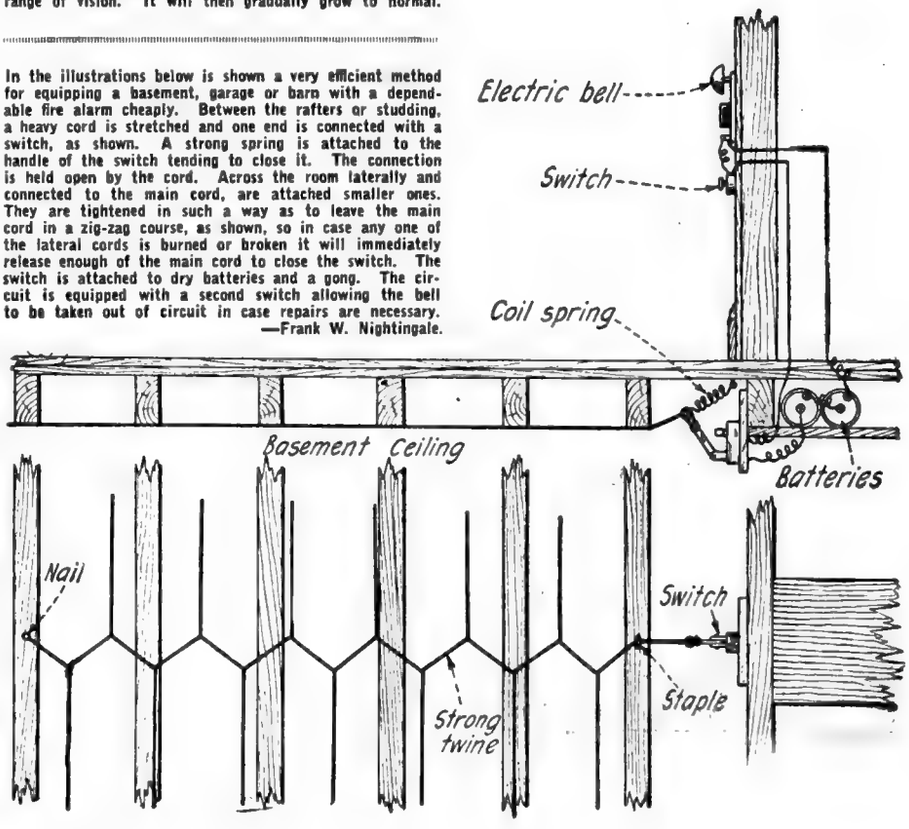



If a paper disk about an inch in diameter is pasted to a frosted lamp shade as shown at the left, and is looked at from a distance of ten or twelve feet, it will seem only about half its regular size when it first comes into the range of vision. It will then gradually grow to normal.

# EFFICIENT FIRE ALARM

In the illustrations below is shown a very efficient method for equipping a basement, garage or barn with a dependable fire alarm cheaply. Between the rafters or studding, a heavy cord is stretched and one end is connected with a switch, as shown. A strong spring is attached to the handle of the switch tending to close it. The connection is held open by the cord. Across the room laterally and connected to the main cord, are attached smaller ones. They are tightened in such a way as to leave the main cord in a zig-zag course, as shown, so in case any one of the lateral cords is burned or broken it will immediately release enough of the main cord to close the switch. The switch is attached to dry batteries and a gong. The circuit is equipped with a second switch allowing the bell to be taken out of circuit in case repairs are necessary.

—Frank W. Nightingale.

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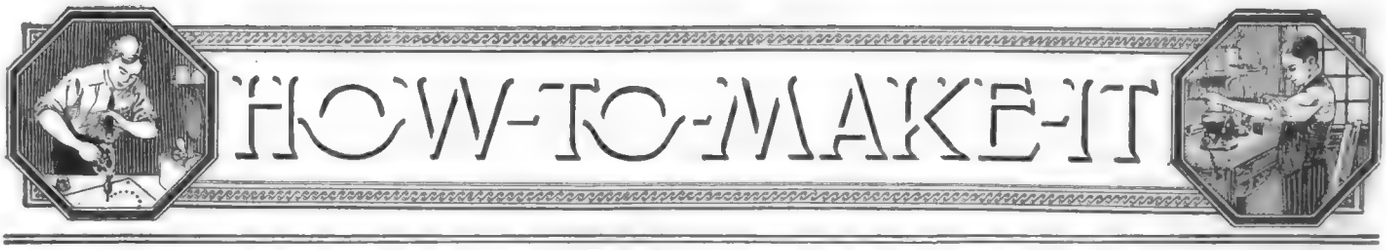
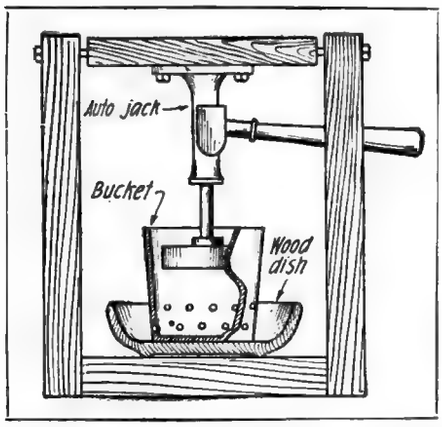



This department will award the following monthly prizes: First prize, $15.00; second prize, $10.00; third prize, $5.00.
The purpose of this department is to stimulate experimenters toward accomplishing new things with old apparatus or old material, and for the most useful, practical and original idea submitted to the Editors of this department a monthly series of prizes will be awarded. For the best idea submitted a prize of $15.00 is awarded; for the second best idea a $10.00 prize, and for the third best a prize of $5.00. The article need not be very elaborate, and rough sketches are sufficient. We will make the mechanical drawings. Use only one side of sheet. Make sketches on separate sheets.

## Fruit Press

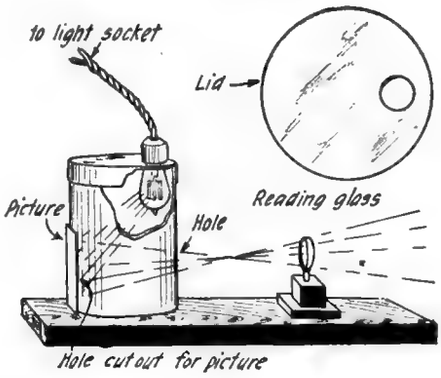
FIRST PRIZE $15

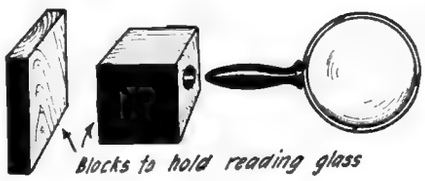



Into a large wood frame constructed as shown above, put a large bucket with two lines of holes drilled around the bottom. Place the fruit to be pressed in the bucket, and on top of it place a circular wooden block, which will fit snugly inside the bucket. Press the fruit by using an automobile jack between the wooden frame and the block on top of the fruit. It is then only necessary to run the jack down, squeezing the fruit through the small holes. For convenience keep a pan beneath the bucket.
—Charles H. Carr.

## Magic Lantern

SECOND PRIZE $10

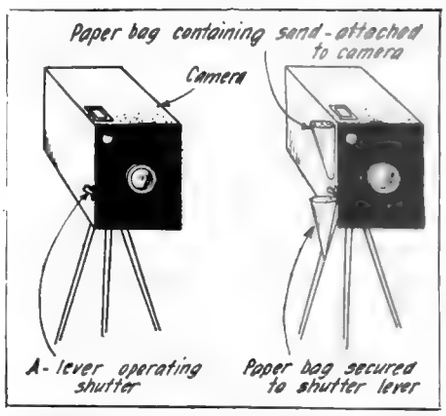



If the light from an ordinary 60-watt lamp is caused to fall on a picture, and the rays passed through a reading glass, a satisfactory magic lantern results. The light and picture are fixed in a bucket or can, as shown. The beams then pass through a hole in the front of the can, then through the reading glass. —George W. Morton.

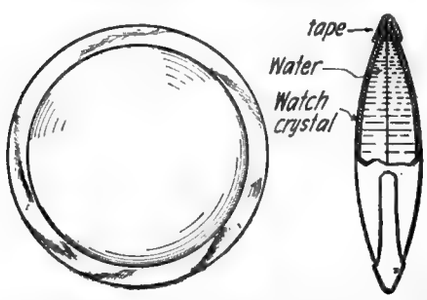
## Shutter Trip

THIRD PRIZE $5



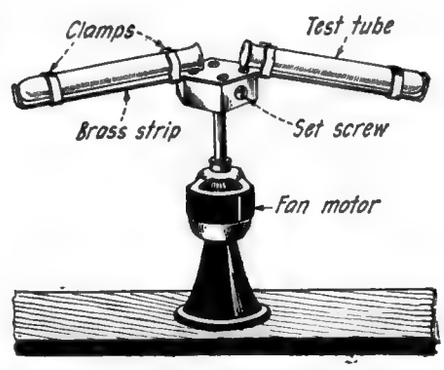

By fastening a paper cone to the shutter of a camera and then placing a second cone of sand above it, allowing the sand to fall into the first one, a time trip is made.
—J. Stevenhagen.

## Watch Crystal Lens



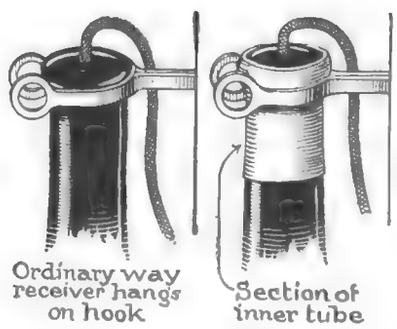

A very serviceable lens can be made by filling two watch glasses, which have been thoroughly waxed and polished, with water, and then sealing the edges. A little grease (vaseline) is smeared carefully around the edges of the glasses, after which they are dipped into the water and put together. Be careful that no air is allowed to remain between them. The lens is then removed, bound with surgeon's adhesive tape, and the edges given a slight coat of vaseline.
—Carlyle Weiss.

## Electrical Centrifuge




By cutting a strip of sheet iron to hold test tubes, as shown above, screwing it tightly to the wooden block, which has a set-screw, and making the whole fast to a fan shaft, an electrical centrifuge is made. —Dr. E. T. Sonendriker.

## Receiver Silencer

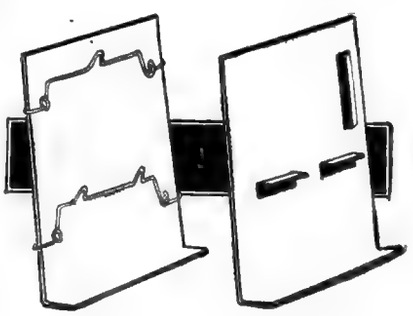



The clatter and mishaps befalling frequently used telephones may be avoided by covering their tops with a short length of inner tube or large rubber hose, as shown above. This precaution will pay for itself many times in broken receiver caps and tempers.
—L. B. Robbins.

## Nipple Placer

By using the metal cone, constructed as shown in the accompanying illustration, the trouble experienced in placing a nipple on the large-mouthed baby bottles, will be greatly reduced. After use, the cone is removed over the body of the bottle as shown.
—Jay G. Hobson.

## Typist's Help



Sheets of tin about 20 inches high, cut and fitted with springs, as shown, set behind a typewriter, make excellent copy holders. On the one to the right, the sheets to be copied are merely set on the protruding lugs, while on the one to the left the stenographer's notebook is placed under the spring wire clips.
—Jacob Schmidt.

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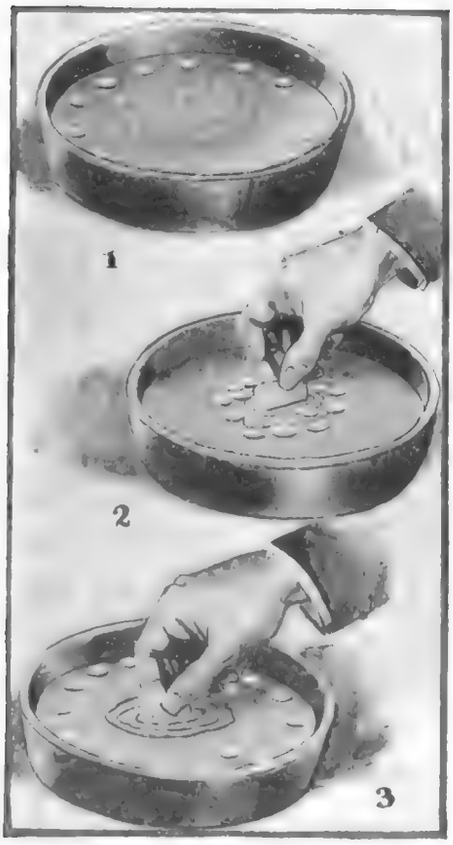
# WRINKLES
## RECIPES & FORMULAS

Edited by S. GERNSBACK

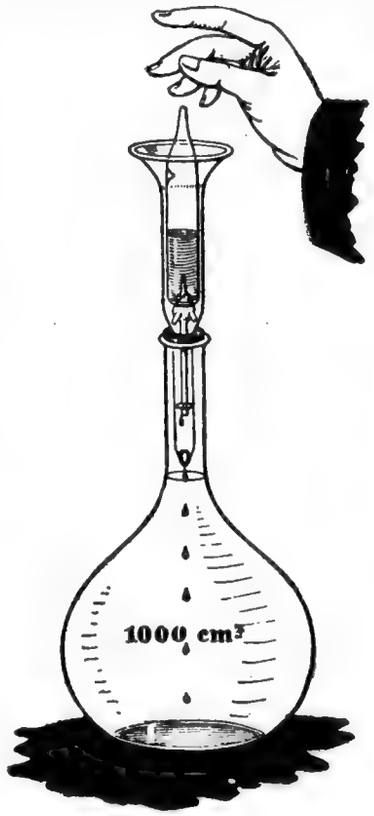
## Sugar-Soap Experiments




Above is illustrated an experiment showing the difference of effects caused by the currents formed on top of a basin of water by substances which are porous and non-porous, and are dissolved in water. Small particles of candle grease are dropped on the edge of the water in the basin, as shown. If a lump of sugar is placed in the center of the pan, the particles are attracted to it. If soap is used instead, they are repelled.

—Dr. Albert Neuburger.

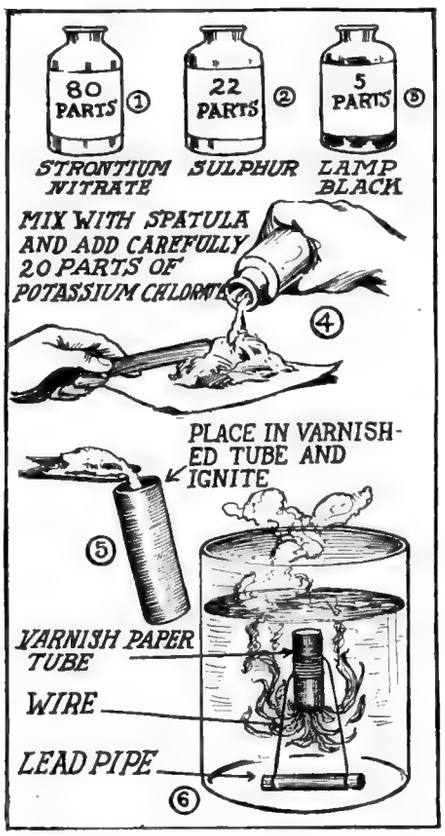
## Measured Chemicals




Knowing the difficulty of amateur chemists in analytical work on account of the high price of the necessary balances on which to weigh chemicals in quantitative work, a New York firm has placed small containers of chemicals very accurately weighed, on the market. The chemical comes dissolved in a known amount of distilled water in an hermetically sealed tube. This tube is broken into a special funnel as shown in the drawing above. By this method the amateur may carry on his work with the accuracy of the expert.

—Raymond B. Wailes.

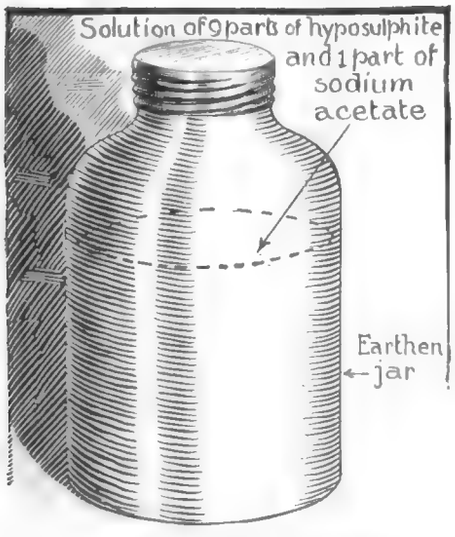
## Fire Under Water Stunt




By mixing the chemicals in the ratios shown in the above sketch very carefully, adding the potassium chloride last, and placing them in a varnished tube supported by wires, attached to a lead pipe, igniting the chemicals and placing the whole in a jar of water, the fire can be made to burn and the flames pass up through water. The lead pipe is used to hold the tube and chemicals under the water.

—Orhan R. Coblentz.

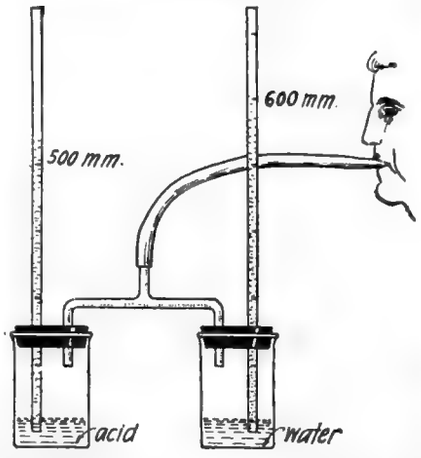
## Hot Water Bottle




Above is shown the construction of a simple chemical hot water bottle. An earthenware jar is used into which a solution of nine parts of sodium hyposulphite and one part of sodium acetate are poured.

—Poly Rene.

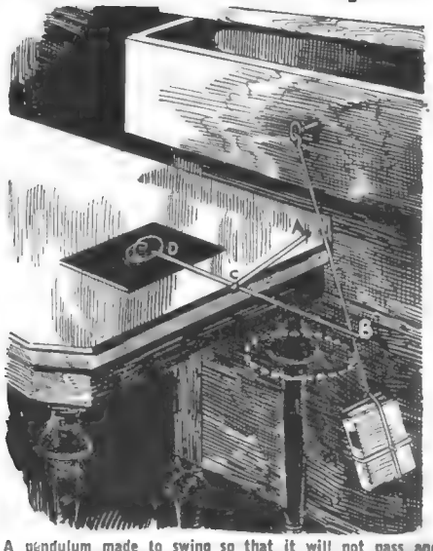
## Specific Gravity Balance




By comparing the height of an unknown liquid with the height of water in two equally sized tubes, under the same amount of air pressure, as shown, the specific gravity of the unknown liquid may be ascertained by calculating the ratio of the height of the two liquids used. Fifty centimeter beakers and six millimeter inside-diameter tubes serve well.

—J. L. Griggs.

## Pendulum Graph




A pendulum made to swing so that it will not pass and repass through its vertical position will describe an ellipse which turns slowly about its center. This is [illegible] the graph apparatus, constructed as shown a[illegible]

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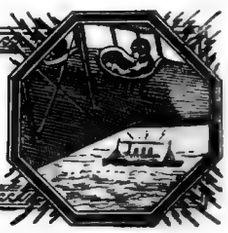
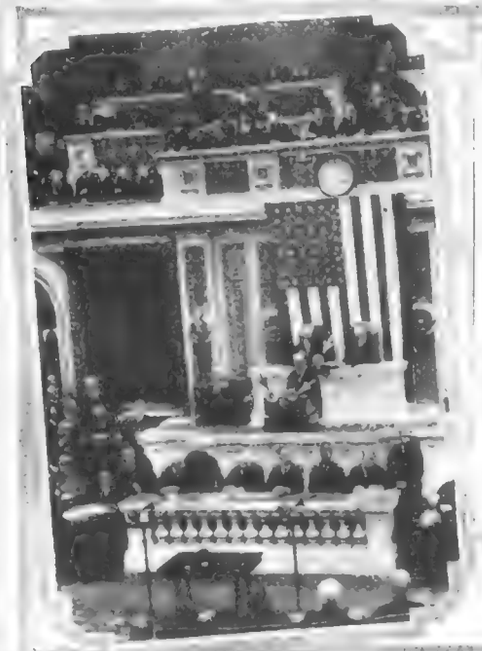
# RADIO

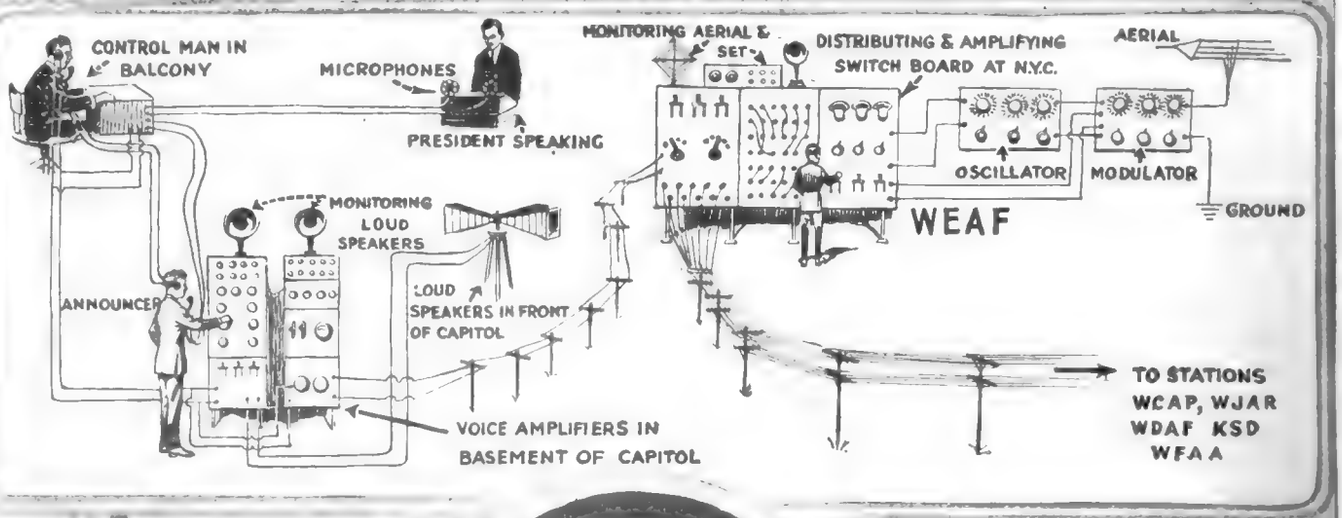


## Broadcasting the President's Message

By A. P. PECK.



For the first time in the history of our country, microphones for use in broadcasting speech were installed in the halls of Congress and were used for broadcasting President Coolidge's message to Congress and as a result hundreds of thousands of citizens throughout the United States were able to hear clearly and distinctly every word of the message. The photograph at the left shows the President as he stood delivering his message. Two microphones directly in front of him are indicated by arrows. Other microphones were installed in the House at the places indicated. By means of this system it was possible to send out electric currents fluctuating in accordance with the President's voice to six radio stations throughout the United States. At these stations the message was transformed into radio waves and broadcast. Many telephone engineers of the Bell System were busily engaged for several days in installing the special apparatus used and testing the circuits so that no mishap would occur during the course of the message. Thousands of people also congregated in front of the Capitol and loud speakers were installed on the steps, which worked from the power amplifiers stationed in the basement.




The drawing above shows, in simplified form, the apparatus used for broadcasting the President's address. The microphones directly in front of the President were controlled by an engineer stationed in the gallery of the House. The microphone of the announcer was also connected to the control box. By this arrangement the engineer in the gallery watched the President and other speakers and communicated with the announcer, thus keeping the system working in perfect unity. At this control either the microphone of the announcer or those in front of the President were cut into the voice amplifier circuit. It is interesting to know that every piece of apparatus used in this broadcasting feat was provided in duplicate and so arranged that either one or the other of the instruments could be used. This was just another safeguard provided by the broadcasting company. Every piece of apparatus was carefully watched by a competent telephone engineer and frequently tested.

The photograph at the left shows the control engineer, with a small switchboard located in the gallery. Note in the diagram, how after being amplified by the instruments in the basement of the Capitol the modulated electric currents were sent out over telephone lines and underground cables to station WEAF, located at 195 Broadway, New York City. Another check-up was made at this point by means of the monitoring set indicated. From the control board at station WEAF telephone lines extended to the various other stations indicated. These stations are located throughout the United States and enabled everyone with a radio set within the borders of the country to hear the President's speech. At various points along the telephone lines from WEAF to Washington and from WEAF to the various other broadcasting stations were located repeater or amplifying stations. These amplifying stations were provided with vacuum tubes which stepped up the incoming current and sent it out on the line again. The current strength was thus maintained until it reached the broadcast station.

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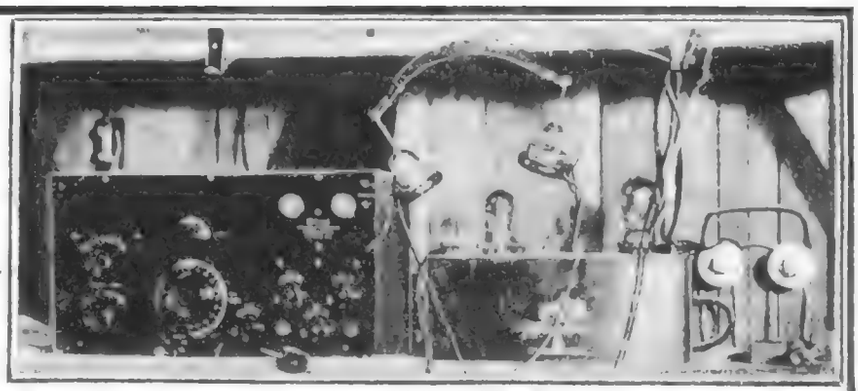
# Radio Cheers Hospital Patients

The patient in the above photograph is plugging in his head phones on a circuit used for distributing the radio music throughout the hospital. A special type of jack is used so that the volume remains constant at each pair of phones, regardless of the number plugged in the circuit. The volume of music is just sufficient to be plainly audible in the receivers and when a patient does not desire entertainment, all he has to do is remove the plug and take off the phones.



Above will be seen the receiving set used in hospital No. 64, Camp Kearney, California, where convalescent war veterans are cared for. The set consists of a standard short wave broadcast receiver with an external power amplifier so arranged that the signals will be audible in special head phones throughout the building. This is the largest radio installation of its kind in this country.

The above photograph is a view of one of the hospital wards, showing the many patients with receivers on their heads. This form of entertainment has proven highly successful and contributes greatly to the comfort of the inmates of the institution. In this installation 9,000 feet of wire are used for connecting to seven separate wards. One hundred and twenty phones are used. —M. Wiley—Reporter No. 3527.

## The Diversified Uses of Radio

No longer need one who desires a haircut or shave listen to the rambling conversation of the barber. At the left will be seen the method used for eliminating this annoyance. A radio set has been installed in the barber shop and music is constantly forthcoming, thereby turning a duty that used to be borne of necessity into an actual pleasure. Directly above is shown another use of radio by means of which the chefs in a large hotel kitchen are entertained by good music and thereby influenced to turn out better meals. The strains of radio music seem to be an exhilarating effect and cause the men to work faster and take an interest in their duties.

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# BROADCAST÷STATIONS

THE question "What becomes of the hams?" has been asked time and again by those who trouble themselves over such things. The picture at the top and to the right will show what has become of one "ham," as the more advanced amateur radio operators are called. These two photos are of broadcasting station WRAY, Scranton, Pennsylvania, which is owned and operated by John Harvard Jones, known to the listeners acquainted with his wave length and his station as "Casey." The two photos of the station show the interior of the studio. The construction follows the usual principles. One of the greatest problems in connection with operating a broadcasting station in a town of comparatively small population is the problem of supplying talent when there is a program to be given every night. This was one of the greatest problems that confronted the owner and operator of WRAY. He solved it in a truly workmanlike way by running a private wire to the town's two chief places of amusement—a theatre and a concert hall. By careful construction and much experimenting all the kinks were taken out of the land line business until it now delivers the voice to the radio microphone with all clearness.

In the photo below is seen station WIAO, at the School of Engineering, Milwaukee, Wisconsin. The broadcasting is done on a two tube 100 watt set.

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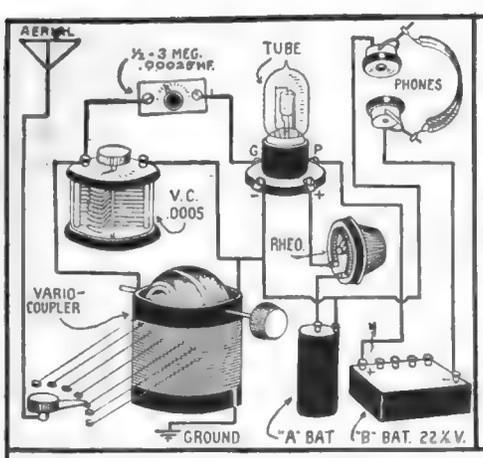
# Radio for the Beginner

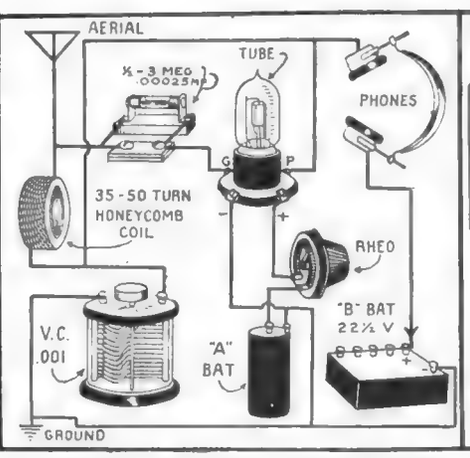
**Information on Circuits of Interest to All Amateurs.**

**By ARMSTRONG PERRY**

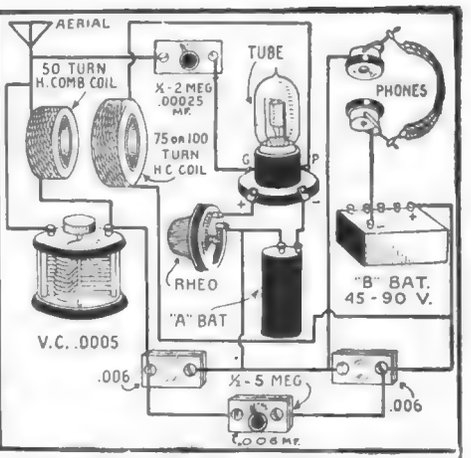
**No. 24.—Single Tube Circuits.**



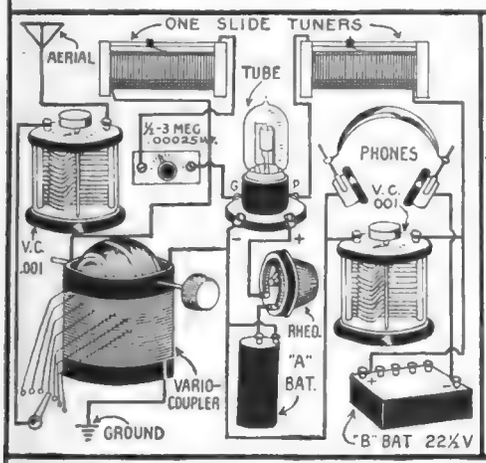

The above circuit diagram shows a vacuum tube connected as a straight detector. This circuit serves very well to study the action of the detector tube. For short range reception it gives very clear signals. Practically no distortion will be found in this circuit because of the absence of regeneration.



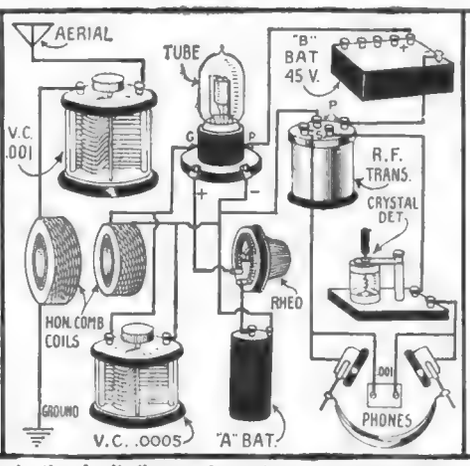

An adaptation of the De Forest ultra-audion or oscillating circuit is shown above. In this set the tuning controls are reduced to one—the variable condenser. Honeycomb coils of various sizes should be tried in this circuit until the size which gives best results is found. For broadcast reception, use a 35,-50 or 75 turn coil.



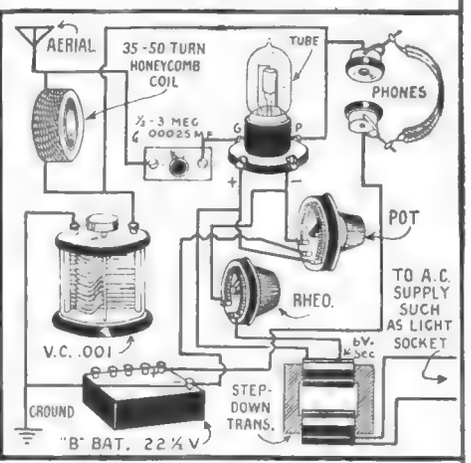

A simplified "super" of the Flewelling type is shown above. Three fixed condensers with a capacity of .006 mf. give rise to the variation frequency; a distinctive feature of any super. Shunted directly across the lowermost condenser in the diagram above is a variable resistance, ranging from one-half to five megohms.



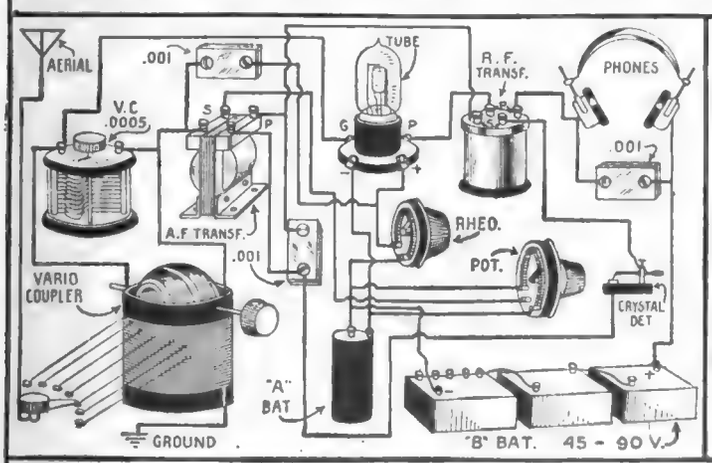

A variation of the standard three circuit tuner consisting of a variocoupler and two variometers is shown above. The two variometers are replaced in this circuit by two one-slide tuners. The operation of this set is similar to a three-circuit tuner. The sliders on the coils, however, are used instead of the knobs of the variometers.



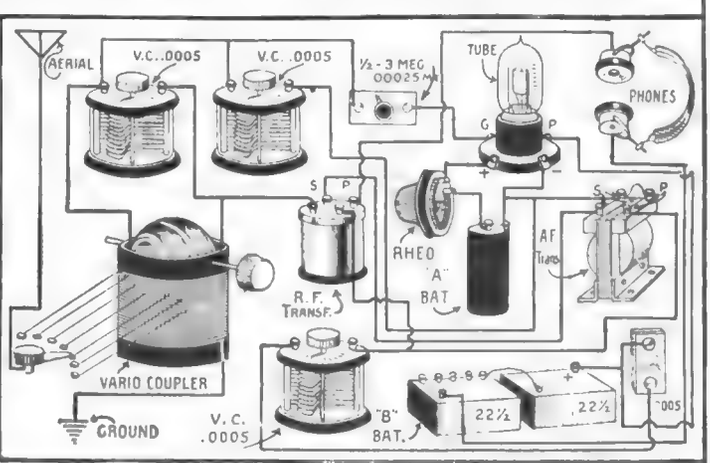

In the circuit diagram shown above, a vacuum tube is employed as a radio frequency amplifier and a crystal detector is placed in the circuit for rectification. The antenna and secondary circuits are tuned with honeycomb coils. Even though no regeneration is used, very good results on "DX" reception may be expected.




It is possible to employ 110-volt A. C. circuit for lighting the filament of a vacuum tube. The hum caused by the A.C. can be cut down by shunting a 200-ohm potentiometer directly across the filament circuit and connecting the grid return to the center post. The potentiometer is varied until the hum is reduced.




Radio and audio frequency amplification may be accomplished with one tube, using a crystal detector for rectification as shown above. In experimenting with a circuit of this type, the amateur should always have at hand two or three different types of both radio and audio frequency transformers, so that he may experiment with them and check the working qualities of the various types against each other. It is often found that certain types of radio frequency transformers will not give good results.




The above circuit diagram shows how both radio and audio frequency amplification as well as rectification may be obtained with the same vacuum tube. This circuit is very critical and is not one of the type which can be hooked up and made to work properly at once. Considerable experimentation is necessary in connection with the various instruments. Radio frequency amplifying transformers should be carefully selected and tested in a set of this type before one of them is permanently mounted.

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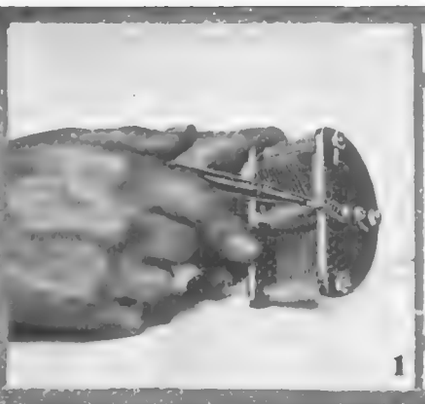
# Radio Trouble Shooting

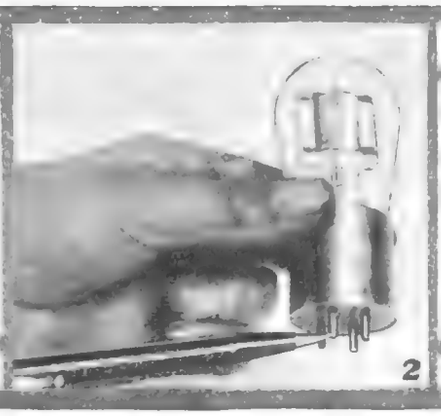
**Illustrating Several Places Where Trouble May Be Encountered.**

BY JACK MILLIGRAM.



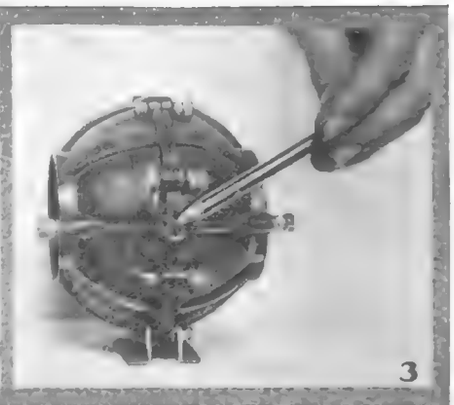
1

One of the greatest bug-bears of radio instruments is the sliding contact. In the above photo, the pencil points to a sliding contact by means of which connection is made to the rotating plates of a standard type of variable condenser. Great losses are very often found here especially when the contact lever becomes loosened. Such connections should be avoided. If it is necessary to purchase instruments of this type, a flexible lead wire should be used.



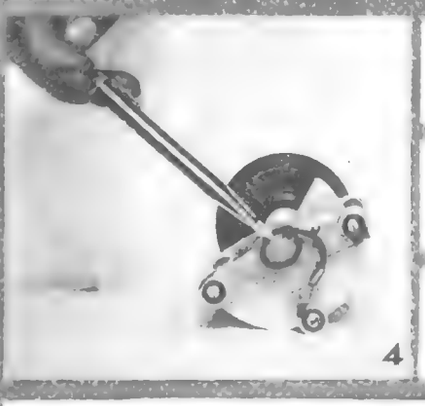
2

Very often the base of a vacuum tube is the seat of trouble in a radio receiving set, but usually this is the last point considered by the amateur when hunting trouble. The pencil in the above photograph points to the end of one of the prongs of a vacuum tube. This point should be carefully cleaned with fine emery paper, making sure that no traces of the emery are left in the soft solder found at this point. Corrosion should not be tolerated at these prongs.



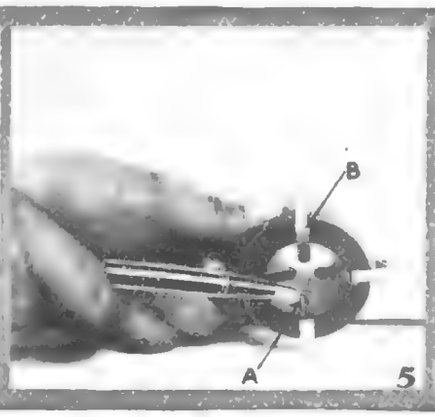
3

Variometers also have their troubles when it comes to the question of making connections to the interior or rotor coil. Above is shown one of the best forms of making such connections. The shaft on which the rotor is mounted is a hollow brass tube and through it are brought the leads from the rotor windings. These leads are of the flexible or "pigtail" type. Stops must be employed so that the rotor will not turn through more than 360 degrees.



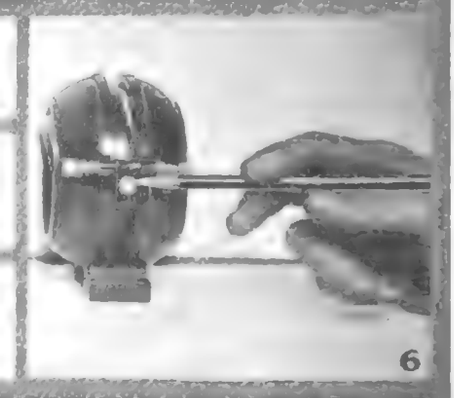
4

The main trouble with rotary variable condensers was illustrated in Fig. 1. Above in Fig. 4 is shown a standard type of variable condenser in which this trouble is eliminated by the manufacturer. It is necessary for the "pigtail" to turn so as to follow the rotary shaft. Therefore, it must be thoroughly flexible so that it will not break after being turned several times. Here again stops should be provided so that the pigtail cannot twist too far.



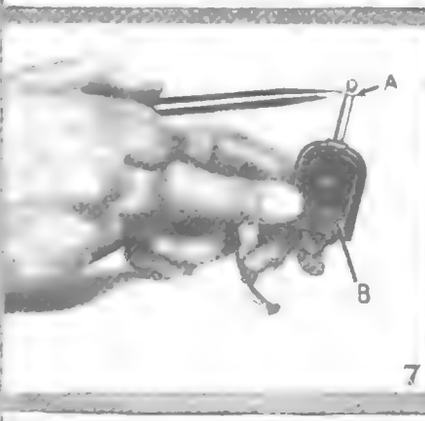

5

Now we come to the troubles of the sockets into which the vacuum tube illustrated in Fig. 2 fits. Many radio ailments are attributed to innocent sources when in reality the blame should be laid on the vacuum tube socket. In the type illustrated above, point A shows one of the lugs bent out so that it does not make contact with the base of the tube. Point B shows where poor contact is very often found between the binding post support and the spring.



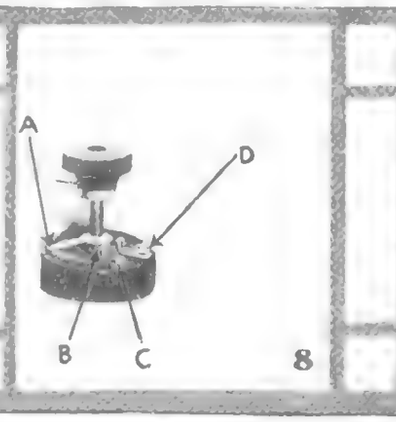
6

The best type of connection for the rotor coils of a variometer is shown in Fig. 3. Above, in Fig. 6, we illustrate a type of variometer which depends upon a sliding contact to connect the rotor coils to the external circuit. Sometimes this works very well, but after much use the bearings usually become enlarged from constant wear and fail to make proper contact. Obviously, such points cannot very well be lubricated and, therefore, the wear increases greatly.



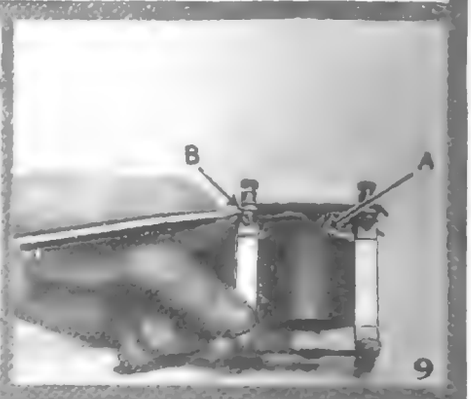

7

A indicates the small insulating disc placed between the two parts of the plug which make contact with two separate springs in the jack. Very often this ring is made of fibre and when it absorbs moisture from the air it becomes a partial conductor. This point should be watched carefully. B indicates the portion of the plug in which contact is made between the tips and the plug. Only the type of plug which grips the phone tips firmly should be used.




8

There are several points on a rheostat which can give rise to trouble. In the above illustration, A indicates the contact arm. Sometimes this arm becomes loosened or the spring is weakened whereupon it fails to make contact with the coil. B indicates the connection between the switch arm and the shaft. This should be kept tight. At C is connected one end of the resistance wire. The binding posts at C and D should always be kept tight




9

Very often the troubles in transformers are due to something which may readily be fixed. For instance, the connection indicated by B very often becomes loose, or if it is soldered, it sometimes becomes unfastened from the base of the binding post. A indicates the connection between the leads to the binding post and the actual windings of the transformer. No amount of strain, however small, should be placed on these leads under any condition.

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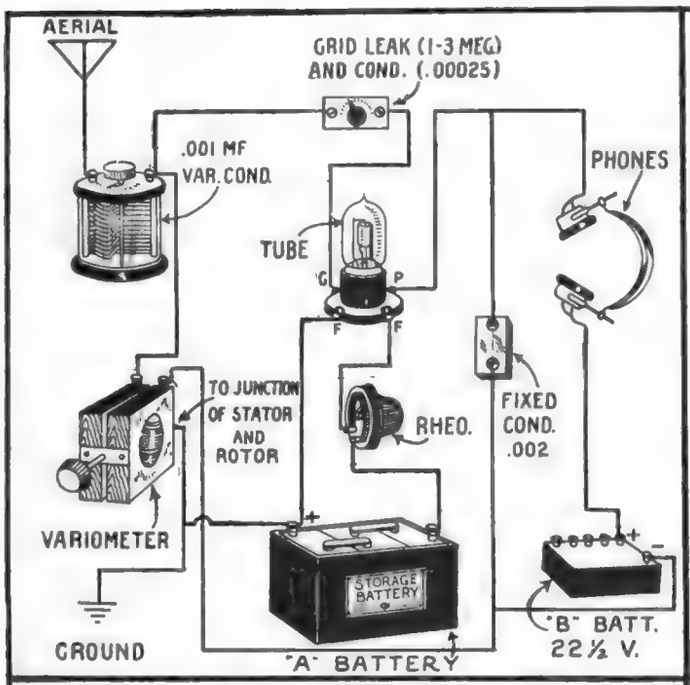
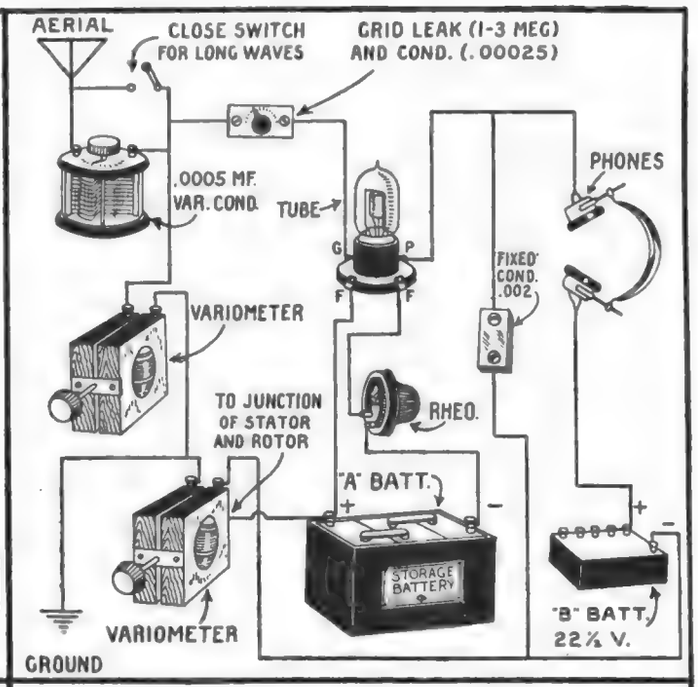
# Variometer and Variable Condenser Receiving Set

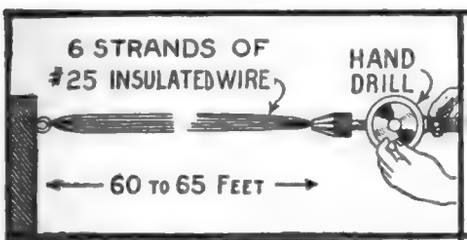



A regenerative receiver having but two controls may be connected up as shown above. Note that the ground lead goes to the junction of the rotor and stator. Since this is the case, only one-half of the total inductance of the variometer tunes the antenna circuit. Therefore, this instrument should be of quite a large size. The "B" battery should be variable from 16 to 22½ volts. Regeneration is accomplished in this case by means of the well known ultra-audion effect. If trouble is found in reaching the required wave-length, the variable condenser may be connected across the variometer from the antenna binding post to the center tap which connects to the ground. In this case, the antenna should be connected directly to the side of the grid leak which goes also to one side of the variometer.

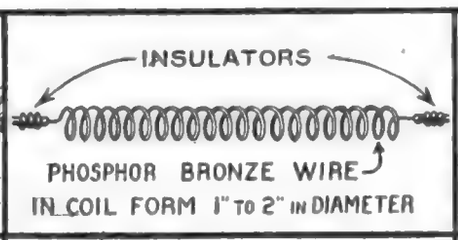



The above circuit diagram shows two variometers connected up in a manner very similar to that originally used by Major Edwin H. Armstrong when experimenting with regenerative circuits. This utilizes a feed-back in which the lower variometer acts both as a feed-back coil and the pick-up coil for the secondary circuit. The antenna circuit is tuned by means of the variable condenser and the upper variometer and the secondary or grid circuit is tuned by means of the latter mentioned instrument. A switch is provided to short-circuit the variable condenser for longer wave-lengths and for still higher results, the variable condenser may be shunted directly across the upper variometer. —W. L. Pearce.

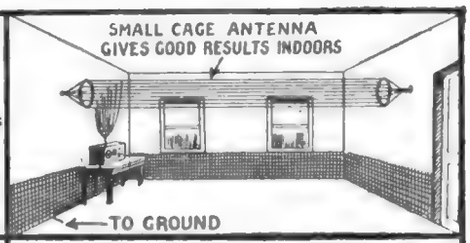
# Short Aerials Increase Selectivity



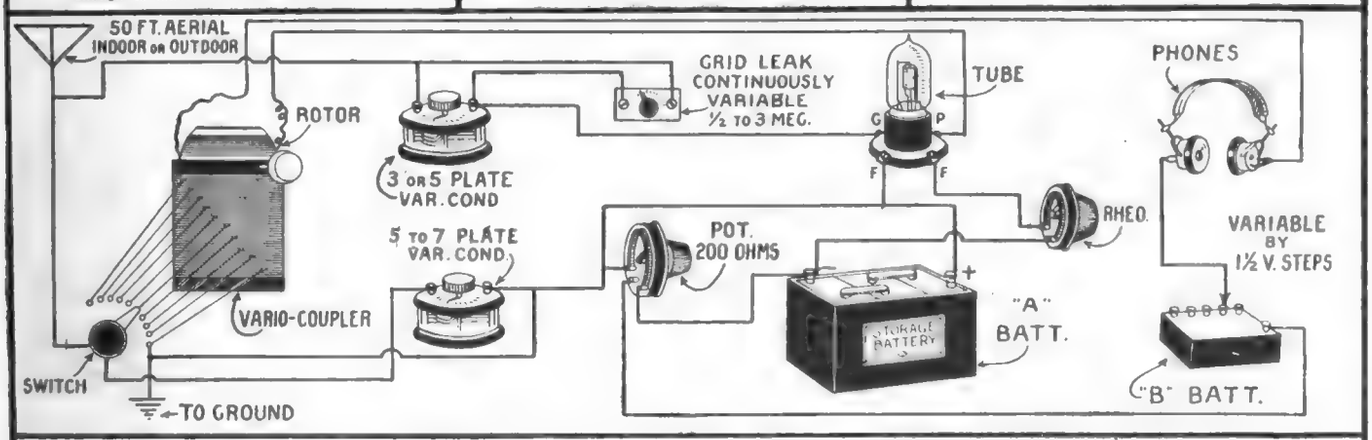

Excellent antenna wire for a short stretch may be made by twisting together six strands of wire with a hand drill as illustrated. The resulting length should be long enough to make both antenna and lead-in.




A coil form of antenna recently placed on the market is illustrated above. This is a coil of phosphor bronze wire about one inch or so in diameter which can be stretched out to as long as 100 feet.




For inside use with a very good receiving set, a cage antenna should be constructed. This aerial may have from 4 to 10 wires and the lead to the set should be composed of the same number.




Where very short antennae are used, it will be found that selectivity will be increased considerably and if careful attention is paid to the adjustment of the instruments, there need be no loss in efficiency or volume. In order to obtain these results, only the best of instruments must be used. Bakelite insulation should be demanded on all instruments and that composition known as "mud" should be carefully avoided. The latter causes comparatively great losses as it is very often a partial conductor. Also in order to attain good results, practically everything on the set should be variable. A variable grid condenser should be used, which should have a maximum capacity of .0003. The ground condenser may be slightly larger, in some cases even as high as .0005 mf. being advisable. A potentiometer should be used in connection with the "A" and "B" battery and the latter should be variable by 1½ volt steps as indicated above. —P

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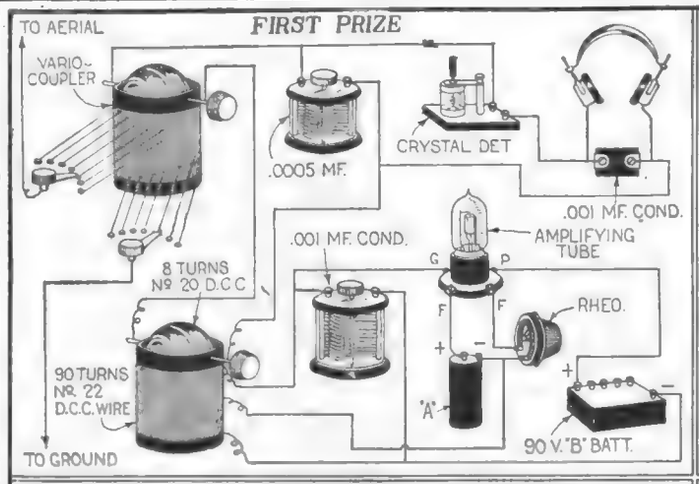
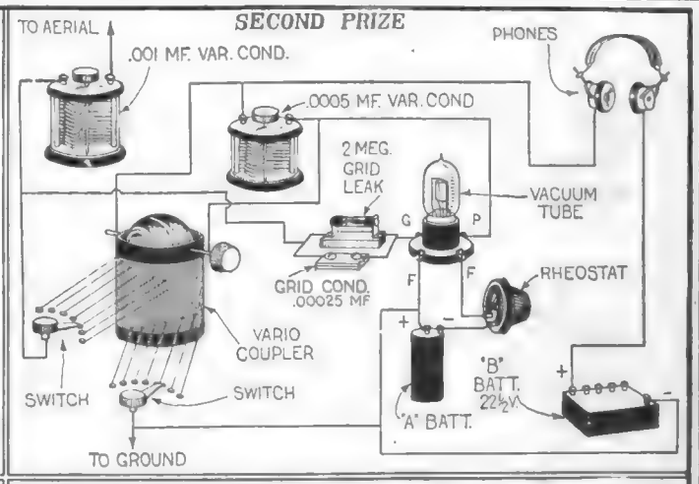
# "DX" Prize Winning Circuits

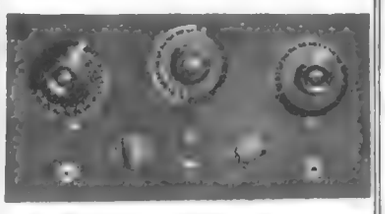
**These Five One-Tube Circuits Won $100.00 in Prizes.**

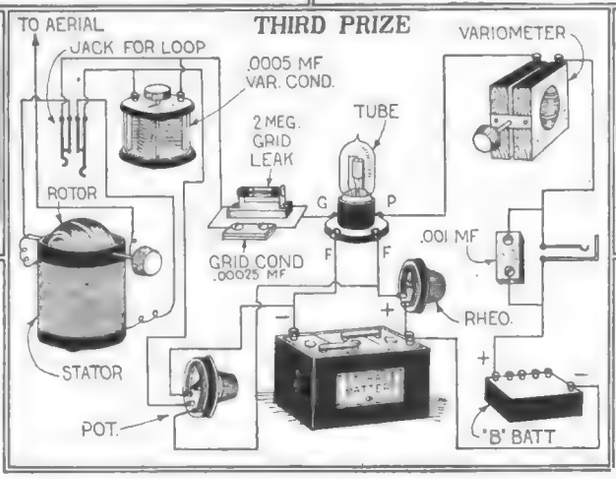



The circuit winning first prize was designed and built by Mr. R. D. B. Washburne and for it he gets a prize of $50. The circuit is plainly shown above. It consists of an oscillator using a vacuum tube and acting upon a crystal detector circuit. All data on the necessary instruments is given in the circuit diagram. The set is tuned by tuning the coupler in series with the antenna and the .0005 mf. variable condenser. The rotor of the oscillation coupler and the .001 mf. variable condenser are then balanced until the best results are obtained.

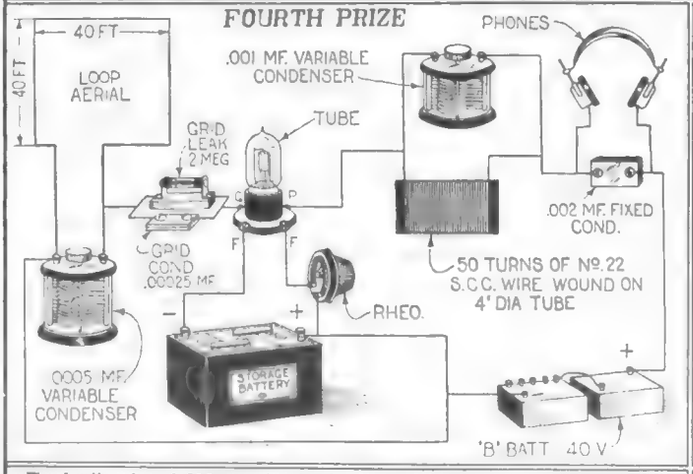



The second prize, $20, goes to Mr. Harry Ackerson. The circuit diagram of Mr. Ackerson's set is shown above. At first glance, it would seem that it is nothing more than a standard single circuit tuner, but there is one addition and therein lies the secret. This is a variable condenser with a small capacity which is shunted across the rotor. This condenser should have a capacity of approximately .0005 mf. The addition of this condenser allows very close tuning and it should be equipped with a vernier so that the set can be handled properly.

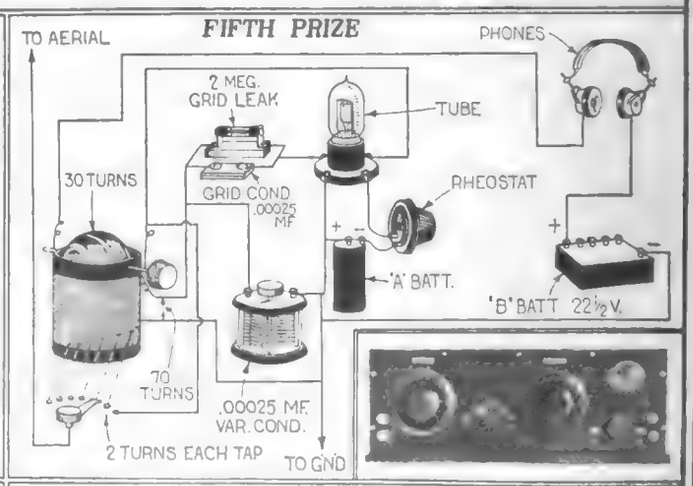




The receiving set designed by Mr. E. H. Cook is illustrated in the photograph above and to the extreme right center of this page. The prize for this set is $15. The circuit diagram of Mr. Cook's set is shown herewith. Note particularly that no ground is used and that the variocoupler is not hooked up in the standard manner. A double circuit jack is included in the secondary circuit so that a loop may be used for local reception. Mr. Cook states that there are three different types of antennas which will operate satisfactorily with this set. One is a four-foot loop with ten turns of No. 20 wire, the second is an ordinary water pipe and the third is a standard single wire outdoor antenna 75 feet long. He states that with the second type, results almost equal to an outdoor antenna were obtained. The constructional details of the variocoupler and variometer are as follows. The stator of the former is wound on a bakelite tube 3¼ inches long by 4 inches in diameter. It consists of 55 turns of No. 26 D.C.C. wire. The secondary or rotor is wound on a tube 2 inches long by 3 inches in diameter, 60 turns of No. 28 D.C.C. wire being necessary. The variometer has 65 turns of No. 26 D.C.C. wire on the stator and a like number of turns of No. 28 D.C.C. wire on the rotor. Both instruments are assembled in the usual manner and may be mounted as illustrated in the photograph. This receiving set was designed to operate over a band of wave-lengths from 200 to 600 meters. During the winter, Mr. Cook states that he had no difficulty in bringing in stations over a distance of 1,000 to 1,500 miles. He also states that the quality of the reproduced signals is very good and in many cases equal in tone to that brought in by a crystal set, while at the same time the volume is much greater.




The fourth prize of $10 goes to Mr. Jack Rogers. He has designed an extremely efficient single tube set to operate on a large outdoor loop placed in a horizontal position. The circuit diagram is given above. This set is an excellent combination of a loop receiver and a tuned plate circuit. The loop being horizontal, does not have a very great directional effect. Because no ground is used, selectivity is increased greatly and no difficulty should be found in bringing in stations over quite a long distance.




Mr. George E. Johnson, winner of the fifth prize, is awarded $5.00. The circuit diagram of his "DX" receiver is shown above, while a photograph of the front of the set appears in the lower right corner. The variocoupler stator is wound on a 4-inch tube. Seven switch points are used, six of them connected to taps on the stator and one to the plate. By placing the switch blade on this point, an excellent oscillating circuit is obtained for use in the reception of C.W. signals. On phone and spark, this set tunes rather sharply and will bring in "DX" signals very well.

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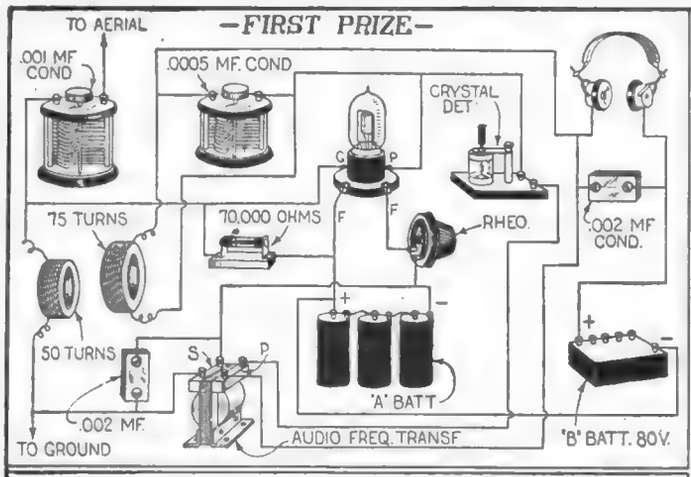
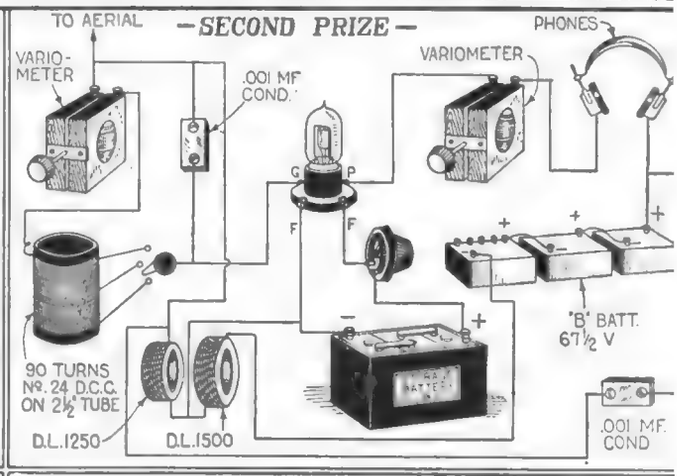
# Loud Talker Set PrizeWinners

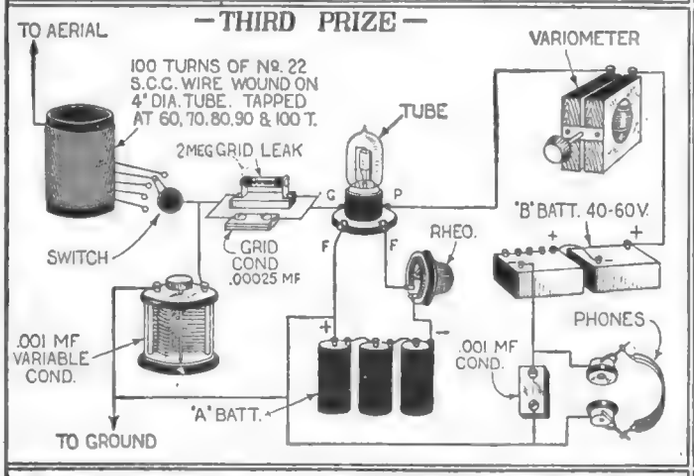
**These Five Circuits Were Selected for the Volume Obtained.**



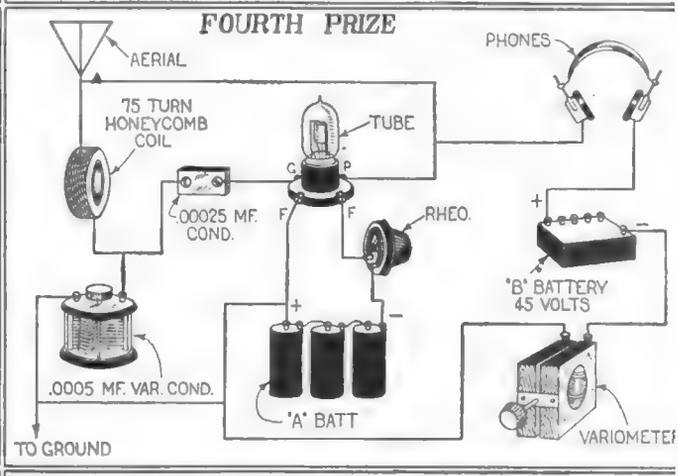

The first prize, $50, in our Single Tube Loud Talker Contest is awarded to Mr. Harry Hahlbohm for the set; circuit diagram given above. Radio frequency amplification is obtained by means of the tickler feed-back which acts as a tuned impedance radio frequency amplifying coil. Audio frequency amplification is obtained through a standard audio frequency amplifying transformer. The main feature of this circuit which must be followed carefully is the 70,000 ohm resistance connected from the grid to the positive side of the "A" battery.



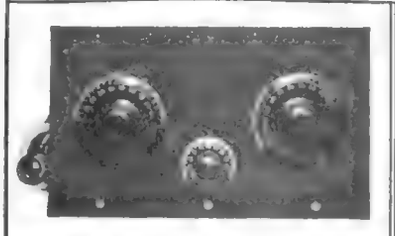

The second prize of $20 goes to Mr. K. J. Dupee for a variation of the Armstrong super-regenerative circuit which is illustrated above. It will be noted that there are only two tuning controls and one control of regeneration. Two standard types of variometers are used and an extra coil, consisting of 90 turns of wire wound on a 2½-inch tube, is connected in series with the grid variometer. This is tapped in three places. The two honeycomb coils need not be coupled together, but may be laid six to eight inches apart in the same plane.

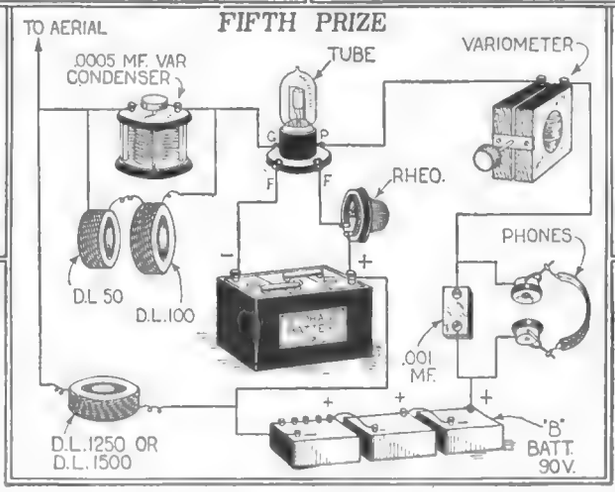


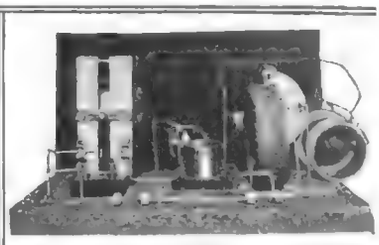

Mr. John H. Odenbach gets the third prize of $15 for a loud talker circuit employing the tuned plate method of regeneration. The data on the antenna tuning inductance is given above. The variometer should be of a large size so as to cover a wide band of wave-lengths. Either a detector or amplifier tube may be used in this circuit and as much "B" battery as possible should be applied to the plate. Any one of the standard tubes from the 1½-volt dry cell tubes up to the 6-volt tubes will give excellent results.




The fourth prize of $10 is awarded to Mr. A. Chipka, Jr. As will be noted his set is a combination of the deForest ultra-audion oscillating principle and the Armstrong tuned plate method of regeneration. Excellent results are obtained with this circuit in selectivity as well as volume. The ultra-audion effect makes oscillation possible over a wide band of wave-lengths. The size of the honeycomb coil used for tuning the antenna should be determined by experiment and three or four coils should be kept on hand so that they may readily be exchanged and different sizes tried.





Mr. Bernard Guth, a New York City amateur and an enthusiastic experimenter with receiving sets, is awarded a $5 prize for his set, capable of operating a loud talker on local stations. Mr. Guth's set is of the super-regenerative type and is quite similar to the Autoplex receiver. The main difference between Mr. Guth's set and the Autoplex is that instead of using a variometer to tune the grid circuit, he uses two honeycomb coils placed in variable inductive relation, connected in series and shunted by a variable condenser. This gives very critical adjustment of the capacity and inductance of the grid circuit. Mr. Guth employs two honeycomb coils mounted in a manner original with him. One of the coils is mounted on a short piece of bus bar wire which in turn extends through the panel and has a knob attached. This bus bar wire passes through the center of the stationary coil. By moving the knob closer to or further away from the panel it is possible to adjust the inductive relation between these two coils. At the same time the variable condenser and the plate variometer are to be balanced until the signals are brought in loudest. Only one large honeycomb coil of either 1,250 or 1,500 turns is necessary to produce the variation frequency or "super" effect. The plate inductance consists of a standard type of variometer, but it should be of a large size and have at least 60 turns of wire on both stator and rotor. A hard or amplifying tube is to be used in this circuit and the "B" battery voltage should be as high as possible. This set, as well as the others awarded prizes in this contest, is subject to considerable experimentation. The instruments should be temporarily connected and tested. Slight changes and additions can then be made until the best operating conditions are found.

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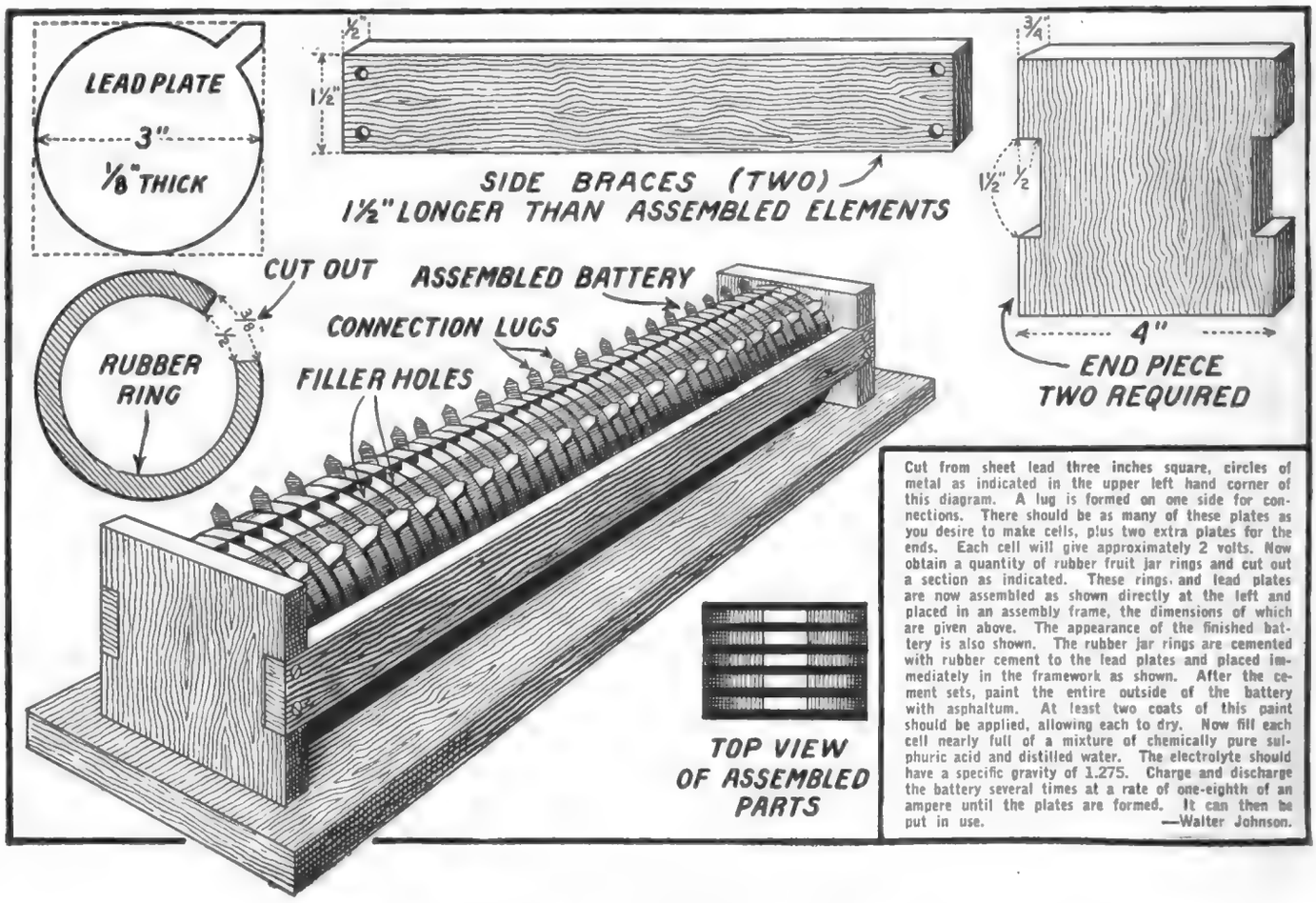
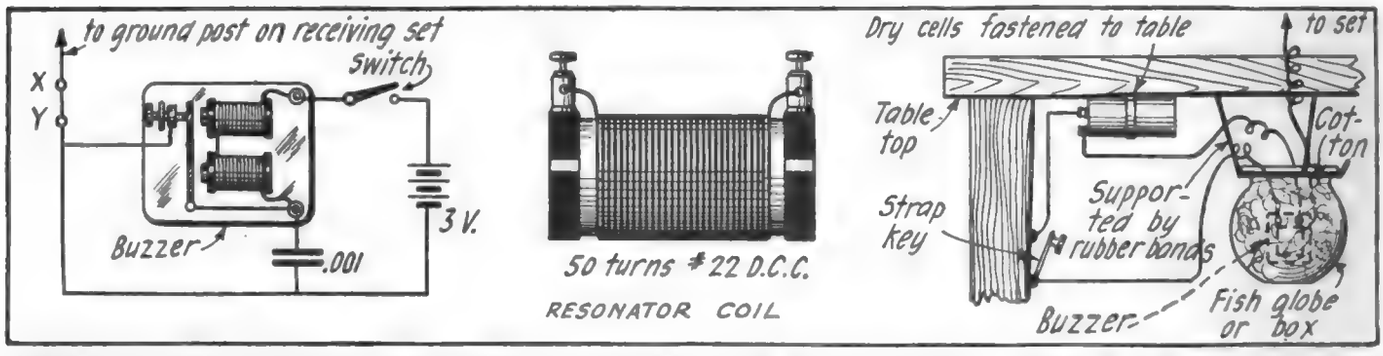
# Simple Storage "B" Battery




Cut from sheet lead three inches square, circles of metal as indicated in the upper left hand corner of this diagram. A lug is formed on one side for connections. There should be as many of these plates as you desire to make cells, plus two extra plates for the ends. Each cell will give approximately 2 volts. Now obtain a quantity of rubber fruit jar rings and cut out a section as indicated. These rings and lead plates are now assembled as shown directly at the left and placed in an assembly frame, the dimensions of which are given above. The appearance of the finished battery is also shown. The rubber jar rings are cemented with rubber cement to the lead plates and placed immediately in the framework as shown. After the cement sets, paint the entire outside of the battery with asphaltum. At least two coats of this paint should be applied, allowing each to dry. Now fill each cell nearly full of a mixture of chemically pure sulphuric acid and distilled water. The electrolyte should have a specific gravity of 1.275. Charge and discharge the battery several times at a rate of one-eighth of an ampere until the plates are formed. It can then be put in use.

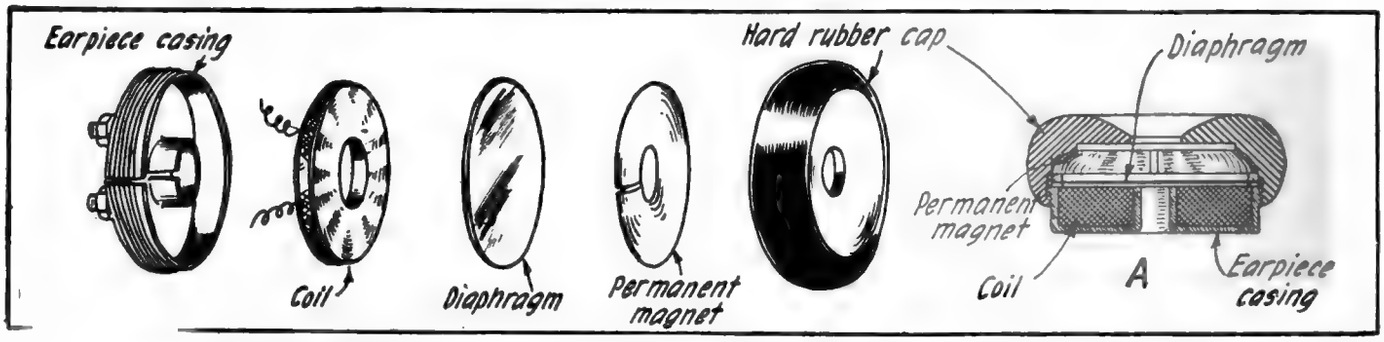
—Walter Johnson.

## Using a Buzzer Test




A buzzer test is a valuable asset to any crystal detector receiving set. Not only will it help to adjust the crystal to its greatest sensitiveness, but sometimes when a signal starts to fade, it can be brought back to its original strength by closing the switch and actuating the test buzzer for a second. A resonator coil is very often of great assistance, and may be connected in series at X-Y. At the right, in the above illustration, will be seen a suggested mounting for all the buzzer test apparatus.

## The Dynaphone--A New Receiver




details of a new radiophone receiver which has recently made its it does not have the usual pole pieces with wire wound thereon as is found in the average phone. Instead, the coil is wound in pancake form and placed within a soft iron casting. The diaphragm is placed over this.

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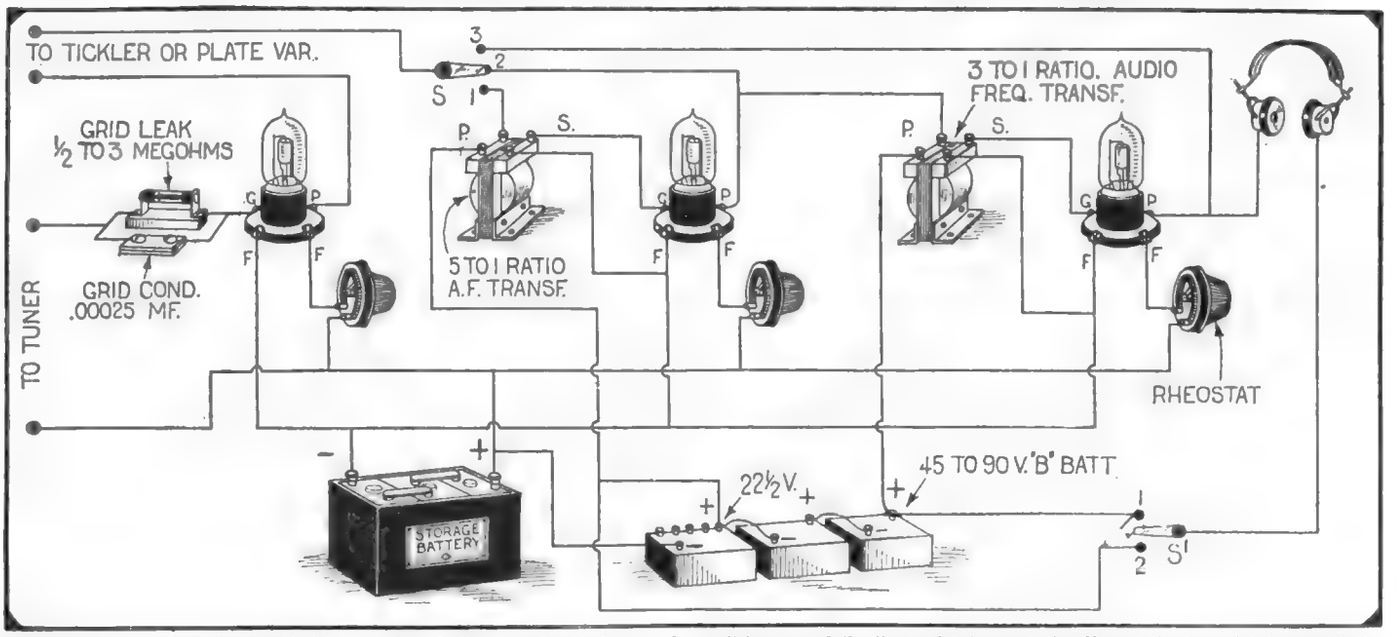
# Radio Oracle

**In this Department we publish questions and answers which we feel are of interest to the novice and amateur. Letters addressed to this Department cannot be answered free. A charge of 25c is made for all questions where a personal answer is desired.**




Q. 218. Since jacks are rather inefficient instruments and often cause trouble because of a slight amount of grit or dirt between the contact points causes an open circuit, they should be avoided. An efficient way of eliminating jacks is to make use of two switches, one of the three point type and the other of the two point type. All the necessary connections are indicated above and the manipulation of the switches is described in the text.

## A. F. AMPLIFIER WITH SWITCHES

(218) G. H. Gillis, M. D., Yatesboro, Penna., asks:

Q. 1. Can you give me a circuit diagram of a detector and two stage amplifier unit used either with a single circuit tuner or a three circuit tuner and include thereon a switch for changing from detector to one or two stages of audio frequency amplification without the use of jacks?

A. 1. In the diagram in these columns we show a detector and two stages of audio frequency amplification. Two switches are indicated. When switch S is on switch point 3 and switch S1 is on switch point 2, the detector alone is being used. With switch S on point 2 and S1 on point 1, the detector and one stage of audio frequency amplification are being used. The third tube then acts as the audio frequency amplifier. With switch S on point 1 and switch S1 on point 1, all three tubes are being used.

## CHANGING TYPE OF TUBES

(219) C. O. Dieter, Rittman, Ohio, asks:

Q. 1. If I decide to substitute U. V.-199 vacuum tubes for those contained in my set at the present time, will any changes have to be made? The tubes I am using now are a U. V.-200 detector, and U. V.-201 amplifier.

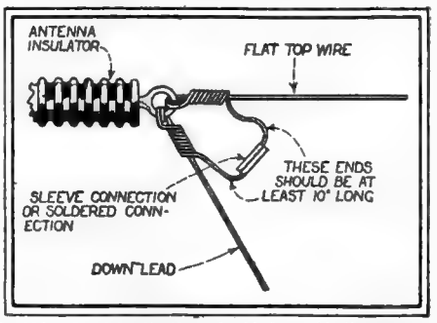
A. 1. In regard to the use of U. V.-199 tubes in your radio set, we would say that no radical changes will be necessary. You will, however, have to either substitute sockets for these tubes as they have different bases than the standard tubes, or else obtain adapters so that the 199s can be used in standard sockets. The above mentioned sockets or adapters can be obtained from companies advertising in the columns of this magazine. You will also have to substitute three dry cells for your present "A" battery and it is advisable to use 30 ohm rheostats.

## LEAD-IN CONNECTION

(220) George Rice, Brooklyn, N. Y., asks the Radio Oracle:

Q. 1. What is the best way, mechanically and electrically, to connect a lead-in wire to a standard flat top aerial?

A. 1. We illustrate in these columns one of the best methods of making this connection The connection between the flat top wire and the lead-in or down-lead has no mechanical strain exerted upon it and, therefore, its electrical qualities are not subject to change thereby. The joint may either be made with a copper sleeve connector or may be soldered.


ANTENNA INSULATOR
FLAT TOP WIRE
THESE ENDS SHOULD BE AT LEAST 10" LONG
SLEEVE CONNECTION OR SOLDERED CONNECTION
DOWN LEAD

Q. 220. Careful attention should be paid the connection of the lead-in to the aerial proper. Above is illustrated the best method for making this joint so that it will be strong and electrically perfect.

## INCREASING SELECTIVITY

(221) M. C. Baker, Los Angeles, Calif, asks:

Q. 1. How can I improve the selectivity of my crystal receiving set consisting of a variocoupler with ten taps and a variable condenser across the rotor?

A. 1. The selectivity of your set may be increased somewhat by placing a variable condenser either in series with the antenna or across the stator as may be found best by experiment. This condenser should have a capacity of .0005 mf.

Since you do not state the length of your antenna it may be that it is too long. If such is the case, you should cut down the length so that it will be no more than 80 to 90 feet long, including the lead-in to the set.

## DRY CELLS WITH CRYSTAL SET

(222) C. H. Dorman, Buchanan, Iowa, wants to know:

Q. 1. Can I connect dry cells in the circuit with my crystal receiver so as to increase the efficiency?

A. 1 We would advise you that you cannot use dry cells on this set with any increase in efficiency; in fact, it would decrease the results obtained. Only in the use of certain crystals can dry cells be used and it has been proven by experiment that such crystals do not give as loud reception and as great range of reception as galena or any one of the other crystals sold on the market today.

## TROUBLE WITH CRYSTAL SET

(223) T. A. Dew, Bronx, N. Y., says that he has a crystal receiving set which does not operate properly. He states that all his instruments are in good condition and that he is using a short piece of copper wire as a cat-whisker. He asks:

Q. 1. Can you suggest some point that could be the trouble with my set?

A. 1. Since you say that your apparatus is all in good shape and tests up correctly, we would say that the trouble is probably in your crystal. Undoubtedly, the latter is not very sensitive. It may be, however, that your instruments are not connected up properly and we would advise you to send us a circuit diagram for inspection. We would further advise that you use a piece of fairly fine phosphor bronze wire as a cat-whisker, having the same coiled in a spiral.

## WANTED!!! RADIO ARTICLES

**WE want descriptions of new radio ideas which you have worked out in practice. Take photographs of the important parts and make pencil or pen and ink sketches of the hook-ups or mechanical details, et cetera. We are particularly desirous of obtaining new hook-ups and descriptions of single tube sets, reflex and other types which have proven satisfactory. We want articles on the latest single tube receptors which require a minimum current from the filament batt[illegible]tor.**

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## INVERSE DUPLEX

(224) J. P. McKenzie, Ensley, Ala., asks:

Q. 1. What is the advantage of the inverse duplex type of receiver over the standard reflex circuit?

A. 1. We will take the circuit diagram published in these columns as an example. Here we see that the first tube on the left acts as the first stage of radio frequency amplification and as the second stage of audio frequency. The center tube acts as the second stage of radio frequency and the first stage of audic frequency. Obviously, the load imposed on the tubes by causing them to act as amplifiers is more equally distributed than in the standard straight reflex. In the latter circuit, the first tube is the first stage of both radio and audio frequency and the second tube is the second stage of both types of amplification. Therefore, the second tube is severely taxed and does not function properly at all times.

Q. 2. Kindly show a circuit diagram of a three tube inverse duplex receiver using a vacuum tube detector.

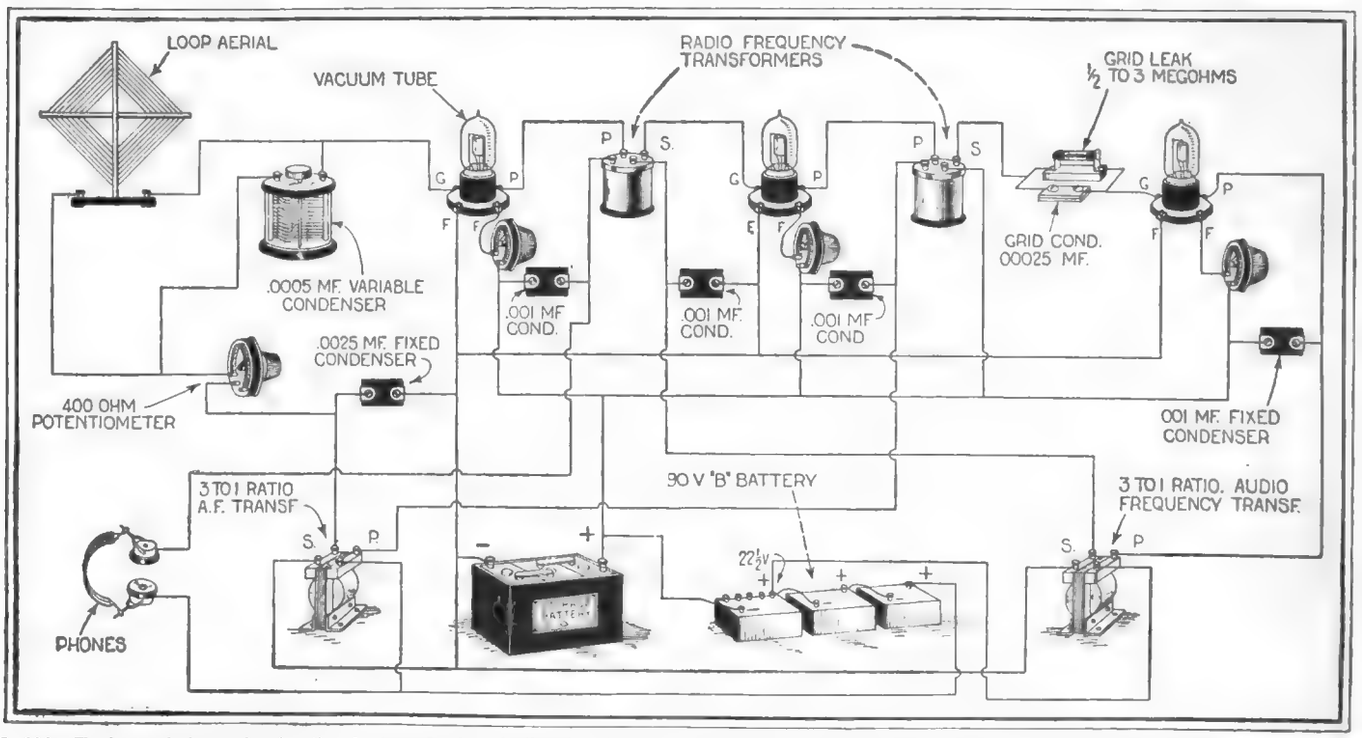
A. 1. The circuit diagram will be found in these columns.

## RADIO FREQUENCY AMPLIFICATION

(225) Roy L. Grant, Eureka, Kansas, asks:

Q. 1. How can I increase the receiving range of a set and can the extra instruments be added to a set comprising a tuner, detector, a two stage audio frequency amplifier, without changing the connections therein?

A. 1. The only way to increase your range to any great extent will be the addition of one or two stages of radio frequency amplification. Unless you are fairly familiar with radio work, however, we would not advise you to attempt this addition as good results would not be obtained without considerable experimental work. If, however, you desire to try such a circuit, send us a description of the tuner, enumerating all the instruments used therein and give a hook-up of the same. We will then show you how to add radio frequency amplification in front of your tuner.




**Q. 224. The inverse duplex receiver has the advantage of not overloading the tubes and rendering them inefficient as is the case in the standard straight type of reflex circuit. The connections for a three-tube set of the inverse duplex type are given above. Two radio and two audio frequency transformers are used in connection with the three tubes giving practically the same form as two stages of radio frequency, detector and two stages of audio frequency amplification.**

## RESISTANCE OF PHONES

(226) O. E. Kaufman, Plains, Kan., asks:

Q. 1. Does the actual resistance of phones have anything to do with their efficiency?

A. 1. The resistance of receivers in radio work has very little to do with the efficiency of the phones. It is the number of ampere turns on the magnets that counts. Phones might much better be rated at their impedance, as for very best results this value should be nearly equal to the internal impedance of the vacuum tube. The talking current actuating a telephone is so light that the question of ohmic resistance plays but a small part in practice. The great point is to get as many turns of wire as possible without making the receiver too clumsy. The simplest way to rate a telephone would be by its resistance except for one thing—the temptation to dishonest people of putting iron or German silver wire in the coil. This gives resistance, but reduces the ampere turns.

## TUNED IMPEDANCE RADIO FREQUENCY AMPLIFICATION

(227) John Moore, Hoboken, N. J., refers to an article appearing on page 258 of the July, 1923, issue of SCIENCE AND INVENTION and asks:

Q. 1. What are the capacities of the condensers C3, C4 and C5?

A. 1. Regarding the capacity of condenser C3, we would advise you to use .001 mf. For C4 and C5 use .00025 or .0005 mf.

Q. 2. Kindly give me the correct data for use in winding the radio frequency amplifying impedance coils.

A. 2. In regard to the tuned impedance radio frequency amplifier that you mention, we would advise you to experiment somewhat with the construction of the impedance coil. The best way would be to wind a 3-inch tube with 45 turns of No. 24 wire, tapped at the 25th, 30th, 35th, and 40th turns. Connect up these taps to switch points and you can experiment until you find out exactly what number of turns will give the best results with your particular tubes.


## 200 ILLUSTRATIONS—100 ARTICLES

is the average of every issue of RADIO NEWS. We doubt if there is a radio magazine in print that can show the diversity of articles and illustrations that is found in this magazine.

But above all, it is the quality of the material that is of prime importance to the man interested in radio. RADIO NEWS appeals to all factions; the Scientist, the Amateur, the Experimenter, the Broadcast Listener, and the Manufacturer. Each will find articles written especially for him. Every issue of RADIO NEWS is a radio education by itself. Sold on 35,000 newsstands in the United States and in every international book store in every civilized country the world over

**A LIST OF INTERESTING ARTICLES APPEARING IN THE FEBRUARY ISSUE OF RADIO NEWS.**

**The First European Radio-Telephone Service, By Dr. Alfred Gradenwitz.**

**Transient Phenomena in Audio Frequency ansformers, By Allen D. Cardwell.**

**A New Invention For Selective Reception, By John Scott-Taggart, F. Inst. P.**

**Engineering Trans-Atlantic Radio Telephony.**

**The Theory, Construction and Use of an Inductance-Capacity Bridge, By Palmer G. Craig.**

**Ultradyne Receiver, By Robert E. Lacault.**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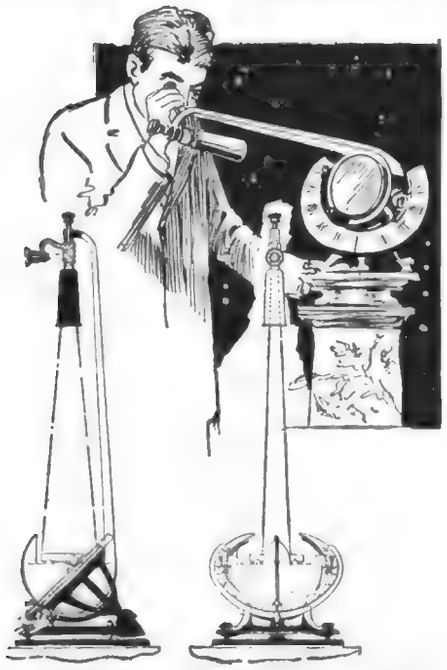
## Reflecting Telescope

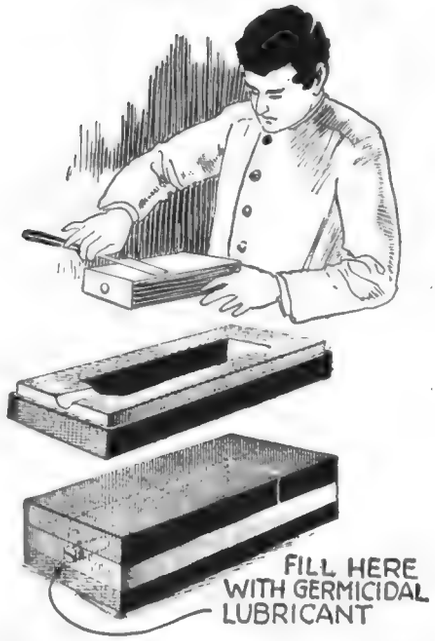


No. 1,468,973 issued to Russell W. Porter. This ornamental garden telescope is capable of relatively rough usage. It comprises an ocular, a concave paraboloidal mirror and a prism or silvered diagonal. The ocular and prism are held at a fixed distance from the mirror, but are capable of adjustment therewith about the polar axis and about the axis of declination. The ocular and prism are likewise rotatable about the optical axis of the mirror, for the convenience of the observer. The entire device is placed out in a garden and protected from the elements merely by its rugged construction.

## Hedge Trimmer

No. 1,471,453 issued to John C. Dettra. This hedge trimmer is of light sturdy construction and may be used in various positions so as to enable the trimmer to trim the sides, tops and other portions of the hedge. The actuating mechanism may be adjusted to various positions with respect to the reciprocating cutting blades. This mechanism comprises the operating handle and a train of gears, one of which is connected by means of a rod to the cutting teeth. The device is carried by the user, as illustrated above.

## Self-Lubricating Razor Hone




No. 1,470,762 issued to Jesse Lee Renau. Heretofore hones for sharpening razors have been used, but an external lubricant was applied to the exterior of the hone. This lubricant was generally of a germicidal nature, but it soon became absorbed and it was necessary to re-supply the hone with the germicidal material. The inventor of this device has designed a razor hone, which has a recess within it into which the germicidal lubricant is poured. This percolates through the pores of the hone and keeps the surface constantly moist.

## Individual Sanitary Saliva Ejector

No. 1,471,207 issued to Napoleon B. Riddle. Ejecting saliva from the mouth of a patient when undergoing dental operations, which make it practically impossible or undesirable to swallow the saliva, is usually done in high-class dental parlors, but the former method was quite unsanitary unless the tube was carefully sterilized. For that reason the inventor believes that the plan which he has patented will serve the purpose. In this method the upper portion of the saliva ejector is made of paper similar to that used in the manufacture of drinking straws found at the soda fountains. This is reinforced and may, of course, be replaced after a patient has used the same.

## Pen Holder

No. 1,453,667 issued to James John Gillis. This invention is without a doubt very practical. Every teacher has noticed that her pupils when beginning to write with a pen, press very firmly upon the pen. With this device such pressure will be impossible because the pen point will slide up into the handle of the pen as soon as undue pressure is brought to bear upon it, calling attention that the child is exerting too much pressure in writing. This tension is under control of the teacher who can adjust the collapsing pressure.

## Phonograph Records

No. 1,471,862 issued to John J. Reinhold. One has often noticed how difficult it is to remove records from phonograph turn-tables, especially when they are thin. A great number of attachments have been made for the purpose of assisting the player in removing the record more easily. The inventor of this system employs a groove around the edge of the disk, which will engage the finger nails so that the record can be easily lifted from the turn-table or if the records are stacked one on top of the other the top one may be easily removed without th[illegible] sliding the records upon each

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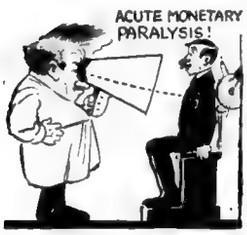
# Scientific Humor

**The "Mile-Age."**—First Stenog. (reading): "Think of those Spaniards going 3,000 miles on a galleon."

Second Stenog: "Aw, forget it. Yuh can't believe all yuh hear about them foreign cars."—*Paul K. Beemer.*

**The Spendthrift.**—There is a New York scientist who is greatly interested in coal mining. He decided to subscribe to a press clipping bureau, to get every new slant on coal. So he said to the service bureau: "I want everything you can find printed about coal."

The first clipping he got was an article about a man who was suing his wife for a separation because she hit him on the head with a lump of coal!—*I. H. Motes.*




**This Is Very Transparent.**—Mr. Short: "If an X-ray operator is preparing to take an X-ray picture of you, does he first look through you to determine just what portion of your body he wishes to photograph?"

Mr. Long: "Yes; and not only that, he even looks though your pocketbook to determine whether or not he wishes to photograph *any* portion of your body at all."—*J. E. Melton.*

**Relic of Antiquity.**—In the motion picture, "Robin Hood," Lady Marian desires to send a message to the Earl of Huntington and chooses Little John to act as her messenger. She hands John a scroll which is protected by a black case or tube. A small boy in the audience asked his mother what it was. "That is a flashlight," she answered aloud.

"Don't show your ignorance Mary," snapped her husband. "They didn't have flashlights in those days. That's a thermos bottle."—*M. Kipp.*

**Coming Dear!**—Jones: "Pat's in the hospital with a broken head!"

Brown: "How come?"

Jones: "He was up trying out that new helicopter of his, and his wife saw him and motioned for him to come down."

Brown: "Well?"

Jones: "He did!"—*Merle Holmes.*

**My Stars!**—Teacher: "What is the hardest science to master?"

Student: "Astronomy."

Teacher: "Why?"

Student: "It's all over my head."—*W. J. Shea.*

**A "Sticker".**—Physics Instructor: "Johnny, define and give an example of adhesion."

Johnny: "Adhesion is a force that holds unlike particles together, such as powder on a lady's face."

Physics Instructor: "Correct! Now define and give an example of cohesion."

Johnny: "Cohesion is a force that con- like particles, such as lips in a kiss."—*Ruth.*

## First Prize $3.00

**He Must Be Yellow!**—First Student: "See that chap coming out of the Lab., that's Brown, our Chemistry Prof., he likes girls, but he's so bashful he acts like litmus paper."

Second Student: "How's that?"

F. S.: "Why, when he's with a girl he turns pink, and when he's alone he gets blue."—*Fred L. Leonard.*

**Flour-Sacks in the Air.**—An Institute visitor saw a non-insulated water-pipe running across the basement ceiling. It was dripping water upon flour-sacks which had congealed upon it from the atmosphere.—*Baking Technology (Chicago).*

*We receive daily from one to two hundred contributions to this department. Of these only one or two are available. We desire to publish only scientific humor and all contributions should be original if possible. Do not copy jokes from old books or other publications as they have little or no chance here. By scientific humor we mean only such jokes as contain something of a scientific nature. Note our prize winners. Write each joke on a separate sheet and sign your name and address to it. Write only on one side of sheet. No letters acknowledged unless postage is included.*

*All jokes published here are paid for at the rate of one dollar each, besides the first prize of three dollars for the best jokes submitted each month. In the event that two people send in the same joke so as to tie for the prize, then the sum of three dollars in cash will be paid to each one.*

**Oh? But He's Beyond the 3-Mile Limit.**—Planetary Gossip (Venus to Saturn over the celestial back fence): "Didn't you hear what happened to old man Sol the other day?"

Saturn: "Why no. What happened to him?"

Venus: "He was pinched for making moon shine!"—*Emil Guidici.*

**A Short Circuit.**—Professor (to boy who has been sent to him for misconduct): "Son, what is your name and why did the teacher send you here?"

Boy: "Sir, my name is Sparks, the teacher saw me gap and it shocked her."—*Thomas J. Adams.*

**Perpetual Motion.**—Rags make paper.
Paper makes money,
Money makes banks,
Banks make loans,
Loans make poverty,
Poverty makes Rags.—*G. Clear.*

**He Should Try a Radio.**—"Ah," said the inventor of mechanical toys, "I've only had one failure in my life."

"And what was the matter with that?" asked his friend.

"It was too realistic."

"What was?"

"I made a toy tramp and it wouldn't work."—*G. Clear.*

**Also the First Amplifier.**—Ray: "Who was the first radio engineer?"

Dio: "Adam because the first loud speaker was made from his spare parts."

Ray: "Ooo—Oh!"—*E. Grunnwadder.*

**Chickenfeed.**—Johnson: "Does you know dat a chicken is the most scientific bird of de world?"

Rastus: "How come dat?"

Johnson: "Yo can eat 'em befo dey is born, and after dey is dead!"—*Foster C. Kitchen.*

**An "Antique" Joke.**—Archimedes: "Give me a fulcrum upon which I may place my lever, and I'll move the earth."

Socrates: "Use the moon."

Diogenes: "But what shall we use for a lever?"

Socrates: "A sunbeam."—*Frank L. Culley.*

**Gassed!!**—Dentist: "What! You don't want gas? You insisted on having gas the last time."

Victim: "You haven't been eating garlic this time."—*Herman L. Gottlieb.*

**As a Matter of Fact.**—Carl was in the science class talking with the girls while the teacher was explaining the lesson on the composition of matter.

All of a sudden the voice of the irate teacher was heard:

"What is the matter Carl?"

Carl all surprised answered:

"Matter is anything that occupies space."—*Carlos Otal, Jr.*

**Nobody 'Ohm.**—Prof: "I wonder why there is so much electricity in my hair?"

Smart Senior: "Because it is attached to a dry cell."—*Fred L. Leonard.*

**Boy! Page the Missus.**—Simple: "They have machines now that can tell when a man is lying. Ever seen one?"

Simpler: "Seen one? By gosh, I married one!—*Merle Holmes.*

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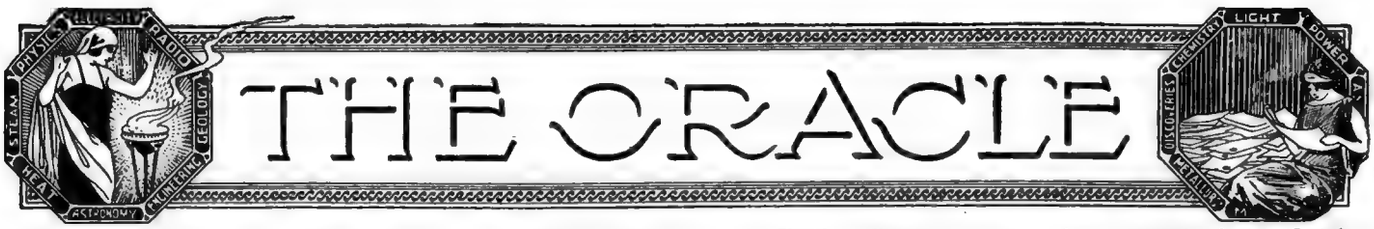



The "Oracle" is for the sole benefit of all scientific students. Questions will be answered here for the benefit of all, but only matter of sufficient interest will be published. Rules under which questions will be answered:

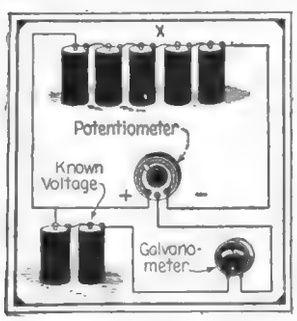
1. Only three questions can be submitted to be answered.
2. Only one side of sheet to be written on; matter must be typewritten or else written in ink, no penciled matter considered.
3. Sketches, diagrams, etc., must be on separate sheets. Questions addressed to the department cannot be answered by mail free of charge.
4. If a quick answer is desired by mail, a nominal charge of 25 cents is made for each question. If the questions entail considerable research work or intricate calculations a special rate will be charged. Correspondents will be informed as to the fee before such questions are answered.

### MEASURING VOLTAGE

(1616) Morris Black, Jersey City, N. J., asks:

Q. 1. How may the voltage of a battery be measured without a volt meter?

A. 1. This work may be done without the use of a volt meter by connecting up apparatus as shown in the illustration. A standard cell with a known voltage is used as indicated. The slider on the potentiometer should be regulated until the galvanometer indicates that no current is flowing through it. At this point on a potentiometer, count the number of turns between the slider and the positive end and place this number in an equation as being equivalent to the voltage of the standard cell. From this we will get a certain number of turns being equal to one volt. Dividing this number into the total number of coils on the entire potentiometer, we have the voltage of cell X.




At the left is shown a circuit diagram for connecting a galvanometer and potentiometer so that the unknown voltage of a battery may be found by comparison. For quickest results, the potentiometer should be graduated so that it may be read directly.

An example will not be out of the way. Suppose that the potentiometer has a total of 100 turns, and that the voltage of the standard cell is 2 volts. Then suppose that a balance takes place when the slider is 20 turns from the positive end. Therefore, we will form the equation of $2 = 20$ and from this we get that $1 = 10$. Dividing 100 by 10 we find that the value of the unknown battery is 10 volts.

### LIGHT YEARS

(1617) Frank H. Cottrill, Port Washington, Wis., asks:

Q. 1. How is the length of a light year measured?

A. 1. The speed of light per second is 186,000 miles approximately. There are approximately 31,557,600 seconds in a year. By multiplying these two figures together you will get very nearly the distance in miles of the astronomical light-year used as a unit of measurement of stellar space.

## Interesting Articles in February "Practical Electrics"

Power Now Transmitted Without Wires
The Radiotron; A Vacuum Tube
By B. S. Havens of General Electric Co.
Simple Oscillograph
By Carter Fiske
Electrical Animals
Tidal Electric Power
By Albert Staehle
Voltage Finder
Electrical Destruction of Atoms
By Professor Rogers D. Rusk
Electric Camera Shutter
By A. Kiedis, Jr.
Carbon Contact Rheostat
Goertz-Beck Arc Lamp
Analogies and Others
By T. O'Conor Sloane, Ph.D.

### EXPANSION OF GASES

(1618) V. C. McKenzie, Brice, Texas, asks:

Q. 1. Are the rates of expansion of various gases different?

A. 1. All the so-called permanent gases expand at very nearly the same rate in accordance with a well known law of physics. A gas at zero degrees C. will expand 1/273, of 1/49 of its volume for every degree (Centigrade and Fahrenheit respectively) of rise in temperatur.

### NICKEL-IRON STORAGE BATTERY

(1619) George M. Lilly, Detroit, Mich., wants to know:

Q. 1. How can I put into service a nickel iron alkaline storage battery which has been idle for some time?

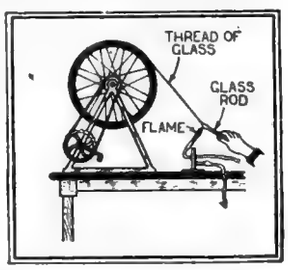
A. 1. Wash out the entire battery thoroughly with warm distilled water. Also make sure that none of the plates are buckled or broken. Then mix the electrolyte as follows: Make a 20 per cent solution of phosphoric acid in distilled water and add enough ordinary household ammonia to neutralize the solution. The neutralization point can be determined by the use of red and blue litmus paper. When neither of the two papers change color when dipped into the solution, it is neutral. After filling your cells to the required depth with this solution, pour a thin layer of mineral oil over the electrolyte in order to retard evaporation. The above solution, while not standard, was recommended to us by a reader who obtained excellent results with the same.

### SPUN GLASS

(1620) Milton Peterson, Baltimore, Md., asks the Oracle:

Q. 1. Can you tell me how to spin a small quantity of glass without the use of expensive apparatus? I desire to use the resulting glass as bristles in a brush for use with strong acids.

Fine threads of glass are occasionally desired for constructing small brushes for handling strong acids. These very fine threads may be made by the experimenter by setting up a wheel as shown at the right.




A. 1. The illustration herewith shows a wheel such as a bicycle wheel mounted in a frame and driven by means of a crank. Start the wheel spinning with one hand and melt the end of a good sized rod of glass. Now draw out a thread of molten glass and carry it around the wheel as the latter spins. After the knack of this is obtained, you will find that the thread of glass will grip the rim and by continuing to turn the wheel by hand and at the same time keeping a fresh supply of glass molten, that the wheel will continue to take up a thread of glass. The rod which is supplying the material must not be advanced too far into the flame for if such is done the end from which the thread is being taken will cool and the thread will break. Also the rod must be advanced far enough so that the flame will not melt the thread. When as much glass as desired has been spun, a knife may be drawn across the multiple threads of glass whereupon it will break and the entire quantity may be removed from the rim. This fine glass may then be used in any way desired.

### ETCHING GLASS AND STEEL

(1621) J. M. Martin, Pauls Valley, Okla., wants to know:

Q. 1. Can you give me formulas or tell me what chemicals must be used for the etching of glass and tool steel?

A. 1. Probably the best material for you to use for etching glass would be hydrofluoric acid. The part which you do not desire to etch can be protected by means of wax. Dilute nitric acid or sulphuric acid, or solution of copper sulphate (blue vitriol) will readily etch steel tools and in this case wax may also be used for protecting the surface which is not to be attacked by the acid.

## OUR $12.000 PRIZE CONTEST

IT will be noted from last month's issue and the present one that our prize contest has been a whale of a success. Over $1,000 has been paid out this month for worth while contributions to SCIENCE AND INVENTION, either in pictures, suggestions, ideas or articles. We now have on our staff, close to 7,000 correspondent reporters who are scouting the world for new material that can be written up for SCIENCE AND INVENTION. And the formula is simple—just keep your eyes open. Even if you were totally deaf or blind, you could still win a prize by simply using your head and sending us ideas of a scientific nature, or of a nature directly or indirectly attached to new inventions.

### ARTICLES FOR MARCH SCIENCE AND INVENTION

The Man on the Asteroid—Part III
By Ray Cummings
The Red Sea Parted—How the Movies Did It
By Edwin Schallert
What is Luminous Paint?
By Ismar Ginsberg, B.Sc., Chem. Engr.
Why Our Naval Guns Should Be Elevated
By Graser Schornstheimer, Naval Expert
Staging Historic Battle Scene for the Screen
Old-Fashioned Weather Predictions—Are They Correct? By E. B. "Farmer" Dunn
Prize Winners in "Psychic Motor" Contest
How to Bind Your Own Books
By Dr. Ernest Bade
Push-Pull Audio-Frequency Amplifier—How to Build It By Joseph H. Kraus
The Airplane Super-Charger—How it Enables Aviators to Fly to Unprecedented Heights
New York's Need of New Under-River Subways to New Jersey
Over 40 Popular Radio Articles—Filled With Details You Need to Know in Building Your Own Set

## FREE INFORMATION

IF you want additional information concerning any of the subjects illustrated and described in this number of SCIENCE AND INVENTION, we shall be glad to give you other data we have at our command. To make this work as easy as possible for our editors, please be brief. Write only on one side of the paper and state exactly in a few words just what it is you desire further information on. We have the original manuscripts and drawings of many of these articles in our files and can furnish much additional data in most cases. Please do not fail to send stamped self-addressed envelope.

Address all inquiries of this nature to INFORMATION EDITOR c/o Science and Invention, 53 Park Place, New York City.

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## TWO-CYCLE GASOLINE ENGINE

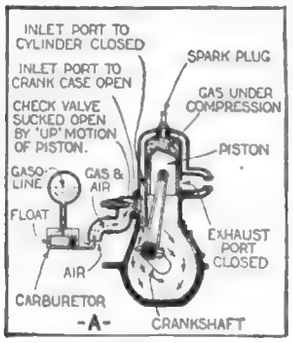
(1622) J. M. Osborne, Detroit, Mich., wants to know:

Q. 1. Has the two-cycle gasoline engine ever been used in large sized power plants such as used in airplanes and other machines propelled by gasoline?

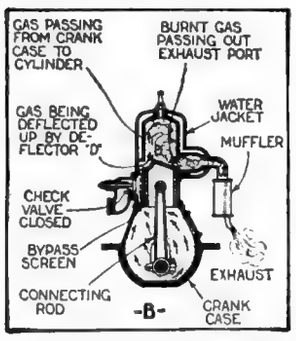
A. 1. The two-cycle gasoline motor has never proven itself efficient when used in high power installations such as are necessary for airplanes. This type has been applied with a fair degree of success to automobiles and motorcycles. It is used for the majority of small boat engines. It has, however, been found practcially impossible to get a perfect exhaustion of the burnt gases and a perfect intake of the explosive mixture in this type of motor, with the result that when the mixture in the firing chamber is ignited, the explosion is not as powerful as it should be. Obviously, this is a great disadvantage in airplane use. Also, the gas mixture, being drawn in through the crank case, dilutes the oil therein, resulting in decreased efficiency.

Q. 2. What is the principle of the operation of a two-stroke or two-cycle gasoline engine?

A. 2. The accompanying illustrations show the principle of operation. In Fig. B the piston is at the bottom of its stroke and two actions are taking place. A gasoline and air mixture is entering the cylinder from the crank case through the by-pass port. The burned gas is passing out through the exhaust port. Therefore, we have intake and exhaust occurring simultaneously. As




At the left in "A" will be seen the piston of a two cycle gasoline engine very nearly at the top of its compression stroke. When it reaches the top, a spark flashes and the piston will be forced downward by the explosion of the gas. Note that the vaporized gasoline first enters the crank case.




At the left a two-cycle gasoline engine is shown at the end of its firing stroke. The burned gases are now passing out through the open exhaust port and at the same time fresh gasoline vapor is coming in from the crank case to the cylinder. The next upward stroke will compress this gas.

will be noticed, the incoming mixture is thrown up toward the top of the cylinder by means of the deflector D on the piston. In Fig. A the piston is very nearly at the top of its stroke. Here again two actions take place. The gas is being compressed by the piston and the spark is just about to take place. Fresh gas is entering the crank case from the carburetor through the inlet port. When the piston reaches the top of its stroke, the spark plug will fire the mixture and the piston will be forced to the position shown in Fig. B, whereupon the action will be repeated.

## FRICTIONAL ELECTRICITY

(1623) L. B. Edgars, Syracuse, N. Y., asks:

Q. 1. What is frictional electricity and how can I produce it experimentally?

A. 1. Frictional electricity may be produced and its results seen by rubbing a stick of sealing

Frictional electricity may be made in an experimental manner by means of a stick of sealing wax and a piece of flannel cloth. The former should be briskly rubbed with the latter, whereupon it will be found that the wax will attract bits of paper.

wax or hard rubber vigorously with a dry warm flannel cloth. Bring the end of the wax or rubber [illegible] some shreds of paper and they will fly to it. [illegible]ctricity so formed is known as static or [illegible]t rest.

## PERPETUAL MOTION?

(1624) A reader has referred to an article appearing on page 225 of the July, 1923, issue of SCIENCE AND INVENTION and states that according to his reasoning the device described therein is actually perpetual motion. He asks our opinion.

In order to obtain an unbiased view of this subject, we have requested Professor Harold F. Richards, a well known authority on scientific matters, to give us his opinion of the practicability of this device. His answer is as follows:

"Theoretically the device is perfectly feasible and can be made to operate. The practical use of the apparatus is, however, another matter.

"There are two kinds of perpetual motion, as the classification goes. One kind is that in which an engine, once started, continues to run without receiving any input of energy. This type is theoretically possible, but not practically so, since all man-made machines have friction. The stellar system approximates to a perpetual motion device of this first class.

"The second type of perpetual motion is that which delivers useful power without requiring any input of power, or, in other words, which delivers more power than it receives. In a machine of such a character there would be actual creation of energy, in violation of the principle of conservation of energy, and, furthermore, in violation of the second law of thermodynamics, which states that heat will not, of itself, pass from a colder to a hotter body. Such a device cannot possibly be made to work, even if we assume ideal conditions and a perfect efficiency of every working part.

"The article on drawing energy from the hot surface layers of sea-water presents no violation of the foregoing principles. Whenever two sources of heat at different temperatures are available, a power-delivery machine is theoretically possible. In the device in question there are two such sources, and the poor conductivity of the water serves to separate them in the same manner, although not as efficiently, as an insulating wall. A hot and a cold source are available, heat tends to flow from a hotter to a colder body, and so a power-generator is possible.

"So far as practical considerations are concerned, the efficiency will be very low, and probably too low for any utility, on account of the small difference of temperature available. Assuming that the high and low temperatures are 25° and 5° Centigrade, respectively, the ideal or theoretical maximum efficiency would be only 7%, since the limiting efficiency is equal to the difference of the two temperatures divided by the absolute temperature of the hot reservoir. Even this low efficiency cannot possibly be realized in practice, since the working parts cannot be perfectly efficient, and if the generator (electric) has an efficiency of 90%, and the turbine an efficiency of 50%, the resulting efficiency, disregarding losses in pumps, would be the product of all the efficiencies listed above, or (.07), (.90), (.50), which is 0.0315, or about 3%. Even this low efficiency cannot be realized in practice, since work must be done in order to bring the hot and cold reservoirs to the same gravitational level, and it seems quite possible that the work necessarily done by the pumps, together with the frictional losses in the long pipes, would wipe out the remaining 3% of useful efficiency. Even so, the device is not a perpetual motion proposition, since theoretically it can be made to work. However, you will easily see from the foregoing figures that any money invested in the proposition would in all probability be lost.

"The simple reasoning given above shows the way to get at the heart of a suggested invention. The 7% is a limiting efficiency towards which engineers may strive in developing the device, although they cannot possibly hope to attain it, for the reasons given. For your information, I may say that one pound of water would, in cooling 1 degree Fahrenheit per second, liberate 1 B. T. U. per second, or 1.058 kilowatts of energy, so that 1,000 pounds of water, cooling 30 degrees Fahrenheit per second, would liberate 31,740 kilowatts of heat power. Not all of this power would be useful. To change 1 lb. of ammonia from liquid to vapor at 75 degrees Fahrenheit would require the cooling of about 19 pounds of water from 75 to 45 degrees F.

"I think you will see from the foregoing that it is hardly worth while to consider the efficiencies of turbines and pumps in order to find out the exact value of the exceedingly small part of the limiting efficiency (of 7%) which would remain. Practically, I should say, the invention is worthless."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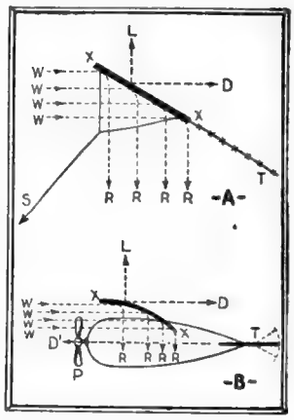
## PRINCIPLE OF THE AIRPLANE

(1625) Richard Frank, Louisville, Ky., requests:

Q. 1. Can you explain in a simple manner the comparison between the forces which keep an ordinary kite in the air and those which allow the use of airplanes?

A 1. The diagram herewith shows the principles of both of the two devices mentioned. In A is an ordinary type of kite which is kept in the air by means of the wind streams marked W.

At the right in Fig. A, will be seen the action of air currents on a kite. The currents coming in the direction W, are deflected toward R, giving rise to the different forces indicated by L and D, known respectively as the lift and drag forces. At B is shown a diagrammatic view of an airplane showing how the same forces act on the plane as on the kite.




When these streams strike the surface they are deflected downward and the reaction of this deflection produces a vertical lift indicated by the arrow L. The kite is held against the pressure of the air stream by the string. The horizontal force which is indicated by the arrow D tends to carry the kite in that direction and is known as the drift force. The tail, T, presumes a stabilizing function and it maintains a constant angle between the surface and the wind.

B in the diagram herewith shows an airplane and the common points between this and the kite can be readily seen. In place of the string on the kite we have the propeller, P, which supplies the resultant required to overcome the drag force indicated by D.

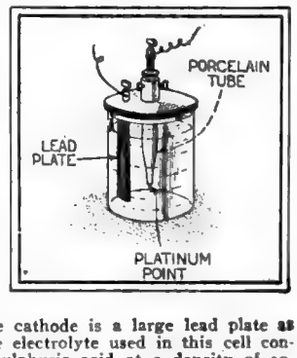
## WEHNELT INTERRUPTER

(1626) E. Lucyinski, Snow Hill, Ala., wants to know:

Q. 1. Can you give a diagram showing the construction of a Wehnelt interrupter and tell what solution is used therein?

A. 1. The diagram herewith shows the details of such an interrupter. The anode or central electrode consists of a platinum point and the wiring connecting this point to the external circuit is encased in a porcelain tube. The amount of the anode exposed is so arranged that it can be adjusted by means of sliding the porcelain tube up

A very good form of electrolytic rectifier is illustrated at the right. This takes the place of the mechanical interrupter often found on spark coils and small transformers. It operates without the usual noise and sputter of a magnetic interrupter.




and down. The cathode is a large lead plate as illustrated. The electrolyte used in this cell consists of dilute sulphuric acid at a density of approximately 1.2. It is sometimes found advisable to add a very small quantity of CuSO4.

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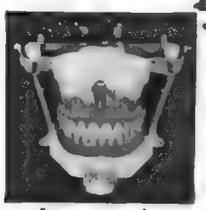

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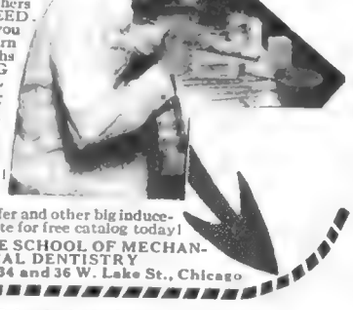

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# Radio Broadcast

**Revised and corrected to date.**

**First group of figures indicate the power in watts in the antenna of the transmitting station. The second group gives the wave-length.**

| Call Letters | Name | Location | Power & Wave Length |
|---|---|---|---|
| KDKA | Westinghouse Electric & Mfg. Co., | East Pittsburgh, Pa. | 1,000—326 |
| KDPM | Westinghouse Electric & Mfg. Co., | Cleveland, Ohio | 250—270 |
| KDPT | Southern Electrical Co., | San Diego, Calif. | 50—244 |
| KDYL | Telegram Publishing Co., | Salt Lake City, Utah | 50—360 |
| KDYM | Savoy Theatre, | San Diego, Calif. | 50—252 |
| KDYQ | Oregon Institute of Technology, | Portland, Ore. | 5—360 |
| KDYS | The Tribune, | Great Falls, Mont. | 50—360 |
| KDYW | Smith Hughes Machinery Co., | Phoenix, Ariz. | 20—360 |
| KDYX | Star Bulletin, | Honolulu, Hawaii | 100—360 |
| KDZB | Frank E. Siefert, | Bakersfield, Calif. | 100—240 |
| KDZE | The Rhodes Co. (Dept Store), | Seattle, Wash. | 100—455 |
| KDZF | Automobile Club of Southern | California, Los Angeles, Calif. | 500—278 |
| KDZI | Electric Supply Co., | Wenatchee, Wash. | 50—360 |
| KDZK | Nevada Machinery & Electric Co., | Reno, Nev. | 25—360 |
| KDZQ | Nichols Academy of Dancing (Hal G. Nichols), | Denver, Colo. | 10—360 |
| KDZR | Bellingham Publishing Co., | Bellingham, Wash. | 50—261 |
| KDZT | Seattle Radio Association, | Seattle, Wash. | 10—360 |
| KFAD | McArthur Bros. Mercantile Co., | Phoenix, Ariz. | 100—360 |
| KFAE | State College of Washington, | Pullman, Wash. | 500—360 |
| KFAF | Western Radio Corporation, | Denver, Colo. | 500—360 |
| KFAJ | University of Colorado, | Boulder, Colo. | 100—360 |
| KFAN | The Electric Shop, | Moscow, Idaho | 50—360 |
| KFAP | Standard Publishing Co., | Butte, Mont. | 100—360 |
| KFAR | Studio Lighting Service Co. (O. K. Olsen), | Hollywood, Calif. | 200—280 |
| KFAU | Independent School District of Boise City, | Boise High School, Boise, Idaho | 150—270 |
| KFAV | Abbot Kinney Co., | Venice, Calif. | 5—224 |
| KFAW | The Radio Den (W. B. Ashford), | Santa Ana, Calif. | 10—280 |
| KFAY | Virgin's Radio Service (W. J. Virgin), | Medford, Ore. | 50—283 |
| KFBB | F. A. Buttrey & Co., | Havre, Mont. | 50—360 |
| KFBC | W. K. Azbill, | San Diego, Calif. | 20—278 |
| KFBE | Reuben H. Horn, | San Luis Obispo, Calif. | 10—360 |
| KFBG | First Presbyterian Church, | Tacoma, Wash. | 50—360 |
| KFBK | Kimball-Upson Co., | Sacramento, Calif. | 100—283 |
| KFBL | Leese Bros., | Everett, Wash. | 10—224 |
| KFBS | Trinidad Gas & Electric Supply Co., and Chronicle News, | Trinidad, Colo. | 15—360 |
| KFBU | The Cathedral (Bishop N. S. Thomas), | Laramie, Wyo. | 50—283 |
| KFCB | Nielsen Radio Supply Co., | Phoenix, Ariz. | 10—238 |
| KFCD | Salem Electric Co. (F. S. Barton), | Salem, Ore. | 20—360 |
| KFCF | Frank A. Moore, | Walla Walla, Wash. | 50—360 |
| KFCH | Electric Service Station, Inc., | Billings, Mont. | 10—360 |
| KFCK | Colorado Springs Radio Co., | Colorado Springs, Colo. | 10—258 |
| KFCL | Los Angeles Union Stock Yards, | San Antonio, Calif. | 500—360 |
| KFCM | Richmond Radio Shop (Frank T. Doeing), | Richmond, Calif. | 100—360 |
| KFCP | Ralph W. Flygare, | Ogden, Utah | 25—360 |
| KFCV | Fred Mahaffey, Jr., | Houston, Texas | 10—360 |
| KFCY | Western Union College, | Le Mars, Iowa | 50—252 |
| KFCZ | Omaha Central High School, | Omaha, Neb. | 100—258 |
| KFDA | Adler's Music Store, | Baker, Ore. | 5—360 |
| KFDD | St. Michaels Cathedral, | Boise, Idaho | 10—252 |
| KFDH | University of Arizona, | Ariz. | 360 |
| KFDJ | Oregon Agricultural C | vallis, Ore. | 3 |
| KFDL | Knight-Campbell Music Co., | Denver, Colo. | 5—360 |
| KFDO | H. Everett Cutting, | Bozeman, Mont. | 50—248 |
| KFDP | Hawkeye Radio & Supply Co., | Des Moines, Iowa | 100—278 |
| KFDR | Bullocks Hardware & Sporting Goods (Robert G. Bullock), | York, Neb. | 10—360 |
| KFDU | Nebraska Radio Electric Co., | Lincoln, Neb. | 20—240 |
| KFDV | Gilbrech & Stinson, | Fayetteville, Ark. | 200—360 |
| KFDX | First Baptist Church, | Shreveport, La. | 100—360 |
| KFDY | South Dakota State College of Agriculture and Mechanic Arts, | Brookings, S. D. | 100—360 |
| KFDZ | Harry O. Iverson, | Minneapolis, Minn. | 5—360 |
| KFEC | Meier & Frank Co., | Portland, Ore. | 50—360 |
| KFEJ | Guy Greason, | Tacoma, Wash. | 10—360 |
| KFEL | Winner Radio Corp., | Denver, Colo. | 50—360 |
| KFEP | Radio Equipment Co. (Jos. L. Turre), | Denver, Colo. | 10—240 |
| KFEQ | J. L. Scroggin, | Oak, Neb. | 150—360 |
| KFER | Auto Electric Service Co., | Fort Dodge, Iowa | 20—231 |
| KFEV | Radio Electric Shop, | Douglas, Wyo. | 100—263 |
| KFEX | Augsburg Seminary, | Minneapolis, Minn. | 100—261 |
| KFEY | Bunker Hill & Sullivan Mining and Concentrating Co., | Kellogg, Idaho | 10—360 |
| KFEZ | Amer. Society of Mechanical Engineers (F. H. Schubert), | St. Louis, Mo. | 100—360 |
| KFFA | Dr. R. O. Shelton, | San Diego, Calif. | 50—242 |
| KFFB | Jenkins Furniture Co., | Boise, Idaho | 10—240 |
| KFFE | Eastern Oregon Radio Co., | Pendleton, Ore. | 10—360 |
| KFFO | Dr. E. H. Smith, | Hillsboro, Ore. | 5—229 |
| KFFP | First Baptist Church, | Moberly, Mo. | 100—275 |
| KFFQ | Marksheffel Motor Co., | Colorado Springs, Colo. | 100—360 |
| KFFR | Nevada State Journal (Jim Kirk), | Sparks, Nev. | 10—226 |
| KFFV | Graceland College, | Lamoni, Iowa | 100—360 |
| KFFX | McGraw Co., | Omaha, Neb. | 250—278 |
| KFFY | Pincus & Murphey, | Alexandria, La. | 100—275 |
| KFFZ | Al G. Barnes Amusement Co., | Dallas, Texas (portable) | 20—226 |
| KFGC | Louisiana State University, | Baton Rouge, La. | 100—254 |
| KFGD | Chickasha Radio & Electric Co., | Chickasha, Okla. | 20—248 |
| KFGH | Leland Stanford University, (P. O.) | Stanford Univ., Calif. | 500—360 |
| KFGJ | Missouri National Guard, 138th Infantry, | St. Louis, Mo. | 250—266 |
| KFGL | Arlington Garage, | Arlington, Ore. | 5—234 |
| KFGP | Cheney Radio Co., | Cheney, Kan. | 10—229 |
| KFGQ | Crary Hardware Co., | Boone, Iowa | 10—226 |
| KFGV | Heidbreder Radio Supply Co., | Utica, Neb. | 10—224 |
| KFGX | First Presbyterian Church, | Orange, Texas | 500—250 |
| KFGZ | Emmanuel Missionary College, | Berrien Springs, Mich. | 10—268 |
| KFHA | Western State College of Colorado, | Gunnison, Colo. | 50—252 |
| KFHB | Rialto Theatre (P. L. Beardwell), | Hood River, Ore. | 5—280 |
| KFHD | Utz Electric Shop Co., St. | Joseph, Mo. | 100—226 |
| KFHF | Central Christian Church, | Shreveport, La. | 150—266 |
| KFHH | Ambrose A. McCue, | Neah Bay, Wash. | 50—283 |
| KFHJ | Fallon & Co., | Santa Barbara, Calif. | 100—360 |
| KFHQ | Curtis Bros. Hardware Store (Alfred E. Fowler), | Los Gatos, Calif. | 5—242 |
| KFHR | Star Electric & Radio Co., | Seattle, Wash. | 100—270 |
| KFHS | Clifford J. Dow, | Lihue, Hawaii. | 30—275 |

(*Continued on page* 1020)

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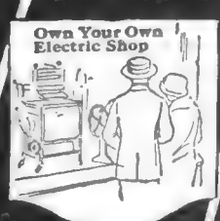


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## RADIO BROADCAST
(Continued)

| Call Letters | Name | Location | Power & Wave Length |
|---|---|---|---|
| KFHU | M. G. Sateren, | Mayville, N. D.. | 50—261 |
| KFHX | Robert W. Nelson, | Hutchinson, Kan. | 50—229 |
| KFI | Earle C. Anthony, Inc., | Los Angeles, Calif. | 500—469 |
| KFIB | Franklin W. Jenkins, | St. Louis, Mo. | 10—244 |
| KFID | R. Arbuckle's Garage, | Iola, Kan. | 20—246 |
| KFIF | Benson Polytechnic Institute, | Portland, Ore. | 100—360 |
| KFIK | Gladbrook Electrical Co., | Gladbrook, Iowa | 20—234 |
| KFIL | Windisch Electric Farm Equipment Co., | Louisburg, Kan. | 30—234 |
| KFIO | North Central High School, | Spokane, Wash. | 50—252 |
| KFIQ | Yakima Valley Radio Broadcasting Association, | Yakima, Wash. | 50—224 |
| KFIU | Alaska Elec. Light & Power Co., | Juneau, Alaska | 10—226 |
| KFIV | V. H. Broyles, | Pittsburg, Kan.. | 20—240 |
| KFIX | Reorganized Church of Jesus Christ of Latter Day Saints, | Independence, Mo. | 250—240 |
| KFIY | Brott Laboratories, | Seattle, Wash. | 15—236 |
| KFIZ | Daily Commonwealth and Oscar A. Huelsman, | Fond du Lac, Wis. | 100—273 |
| KFJA | Central Power Co., | Grand Island, Neb. | 100—244 |
| KFJB | Marshall Electrical Co., | Marshalltown, Iowa | 10—248 |
| KFJC | Seattle Post Intelligencer, | Seattle, Wash. | 100—233 |
| KFJD | Weld County Printing & Publishing Co., | Greeley, Colo. | 50—236 |
| KFJF | National Radio Mfg. Co., | Oklahoma City, Okla. | 20—252 |
| KFJH | The Sugar Bowl (H. R. Shaw), | Selma, Okla. | 10—273 |
| KFJI | Liberty Theatre (E. E. Marsh), | Astoria, Ore. | 10—252 |
| KFJJ | Carrollton Radio Shop, | Carrollton, Mo. | 50—236 |
| KFJK | Delano Radio & Electric Co., | Bristow, Okla. | 100—233 |
| KFJL | Hardsacg Mfg. Co., | Ottumwa, Iowa | 10—242 |
| KFJM | University of North Dakota, | Grand Forks, N. D. | 100—229 |
| KFJR | Ashley C. Dixon & Son, | Stevensville, Mont. (near) | 50—253 |
| KFJV | T. H. Warren, | Dexter, Iowa | 10—224 |
| KFJW | Le Grand Radio Co., | Towanda, Kan. | 10—226 |
| KFJX | Iowa State Teachers College, | Cedar Falls, Iowa | 50—229 |
| KFJY | Tunwall Radio Co., | Fort Dodge, Iowa | 50—246 |
| KFJZ | Texas National Guard, 112th Cavalry, | Fort Worth, Texas.. | 20—254 |
| KFKA | Colorado State Teachers College, | Greeley, Colo. | 50—248 |
| KFKB | Brinkley-Jones Hospital Association, | Milford, Kan. | 500—286 |
| KFKH | Denver Park & Amusement Co., | Lakeside, Colo. | 10—226 |
| KFKQ | Conway Radio Laboratories (Ben H. Woodruff), | Conway, Ark. | 150—224 |
| KFKV | F. F. Gray, | Butte, Mont. | 50—283 |
| KFKX | Westinghouse Electric & Mfg. Co., | Hastings, Neb. | 500—286 |
| KFKZ | Nassour Bros. Radio Co., | Colorado Springs, Colo. | 10—234 |
| KFLA | Abner R. Willson, | Butte, Mont. | 5—283 |
| KFLB | Signal Electric Mfg. Co., | Menominee, Mich. | 20—248 |
| KFLD | Paul E. Greenlaw, | Franklinton, La. | 20—234 |
| KFLE | National Educational Service, | Denver, Colo. | 25—268 |
| KFLH | Erickson Radio Co., | Salt Lake City, Utah | 50—261 |
| KFLP | Everette M. Foster, | Cedar Rapids, Iowa | 20—240 |
| KFLQ | Bizzell Radio Shop, | Little Rock, Ark. | 20—261 |
| KFLR | University of New Mexico, | Albuquerque, N. M. | 100—254 |
| KGB | Tacoma Daily Ledger, | Tacoma, Wash. | 50—252 |
| KGG | Hallock & Watson Radio Service, | Portland, Ore. | 50—360 |
| KGN | Northwestern Radio Mfg. Co., | Portland, Ore. | 100—360 |
| KGU | Marion A. Mulrony, | Honolulu, Hawaii | 250—360 |
| KGW | Portland Morning Oregonian, | Portland, Ore. | 500—492 |
| KGY | St. Martins College, | Lacey, Wash. | 5—258 |
| KHJ | Times Mirror Co., | Los Angeles, Calif. | 500—395 |
| KHQ | Louis Wasmer, | Seattle, Wash. | 100—360 |

(*Continued on page* 1022)

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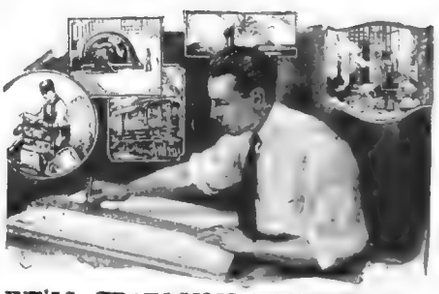

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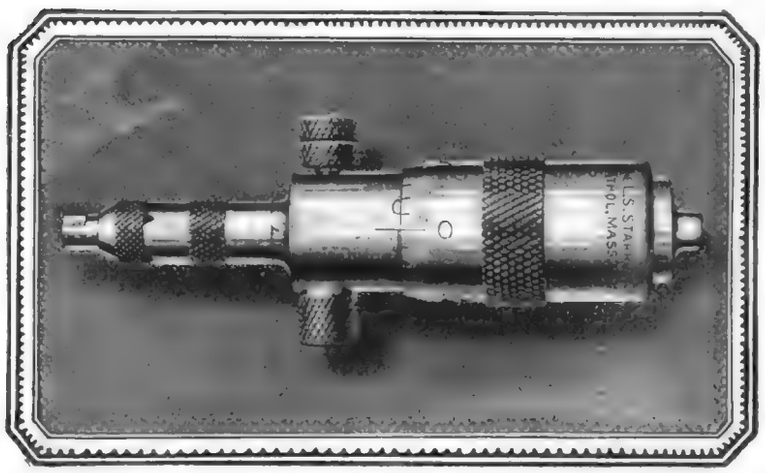

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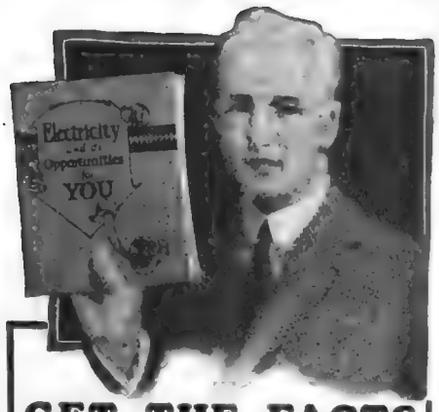


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| Call Letters | Name | Location | Power & Wave Length |
|---|---|---|---|
| KJFU | Central Power Co., | Kearney, Neb. | 10—234 |
| KJQ | C. O. Gould, | Stockton, Calif. | 5—360 |
| KJR | Northwest Radio Service, | Seattle, Wash. | 100—270 |
| KJS | Bible Institute of | Los Angeles, Calif. | 750—360 |
| KLN | Monterey Electric Shop, | Monterey, Calif. | 10—261 |
| KLS | Warner Bros. Radio Supplies Co., | Oakland, Calif. | 250—360 |
| KLX | Tribune Publishing Co., | Oakland, Calif. | 250—360 |
| KLZ | Reynolds Radio Co., | Denver, Colo. | 500—360 |
| KMJ | San Joaquin Lt. & Power Corp., | Fresno, Calif. | 250—273 |
| KMO | Love Electric Co., | Tacoma, Wash. | 10—360 |
| KNJ | Roswell Public Service Co., | Roswell, N. M. | 500—250 |
| KNT | Grays Harbor Radio Co. (Walter Hemrich), | Aberdeen, Wash. | 250—263 |
| KNV | Radio Supply Co., | Los Angeles, Calif. | 100—256 |
| KNX | Electric Lighting Supply Co., | Los Angeles, Calif. | 100—360 |
| KOB | New Mexico College of Agriculture and Mechanic Arts, State College, | N. M. | 500—360 |
| KOP | Detroit Police Dept., | Detroit, Mich. | 500—286 |
| KPO | Hale Bros., | San Francisco, Calif. | 500—423 |
| KQI | University of California, | Berkeley, Calif. | 500—360 |
| KQP | Apple City Radio Club, | Hood River, Ore. | 10—360 |
| KQV | Doubleday Hill Electric Co., | Pittsburgh, Pa. | 500—360 |
| KQW | Chas. D. Herrold, | San Jose, Calif. | 50—360 |
| KRE | Berkeley Daily Gazette, | Berkeley, Calif. | 50—278 |
| KSD | Post Dispatch (Pulitzer Pub. Co.), | St. Louis, Mo. | 500—546 |
| KSS | Prest & Dean Radio Co. & Radio Research Society of | Long Beach, Calif. | 20—360 |
| KTW | First Presbyterian Church, | Seattle, Wash. | 500—360 |
| KUO | Examiner Printing Co., | San Francisco, Calif. | 150—360 |
| KUS | City Dye Works & Laundry Co., | Los Angeles, Calif. | 100—360 |
| KUY | Coast Radio Co., | El Monte, Calif. | 50—256 |
| KWG | Portable Wireless Telephone Co., | Stockton, Calif. | 100—360 |
| KWH | Los Angeles Examiner, | Los Angeles, Calif. | 500—360 |
| KXD | Modesto Herald Publishing Co., | Modesto, Calif. | 10—252 |
| KYQ | Electric Shop, | Honolulu, Hawaii | 20—360 |
| KYW | Westinghouse Electric & Mfg. Co., | Chicago, Ill. | 1,000—536 |
| KZM | Preston D. Allen, | Oakland, Calif. | 50—360 |
| KZN | The Desert News, | Salt Lake City, Utah | 500—360 |
| KZV | Wenatchee Battery & Motor Co., | Wenatchee, Wash. | 50—360 |
| WAAB | Valdemar Jensen, | New Orleans, La. | 100—268 |
| WAAC | Tulane University, | New Orleans, La. | 400—360 |
| WAAD | Ohio Mechanics Institute, | Cincinnati, Ohio | 25—360 |
| WAAF | Chicago Daily Drover's Journal, | Chicago, Ill. | 200—286 |
| WAAH | Commonwealth Electric Co., | St. Paul, Minn. | 100—360 |
| WAAK | Gimbel Bros., | Milwaukee, Wis. | 100—280 |
| WAAM | I. R. Nelson Co., | Newark, N. J. | 250—263 |
| WAAN | University of Missouri, | Columbia, Mo. | 50—254 |
| WAAW | Omaha Grain Exchange, | Omaha, Neb. | 200—360 |
| WAAZ | The Hollister-Miller Motor Co., | Emporia, Kan. | 100—360 |
| WABA | Lake Forest College, | Lake Forest, Ill. | 100—266 |
| WABB | Dr. John B. Lawrence, | Harrisburg, Pa. | 10—266 |
| WABC | Fulwider-Grimes Battery Co., | Anderson, Ind. | 10—229 |
| WABD | Parker High School, | Dayton, Ohio | 10—283 |
| WABE | Young Men's Christian Association, | Washington, D. C. | 50—283 |

(*Continued on page* 1024)


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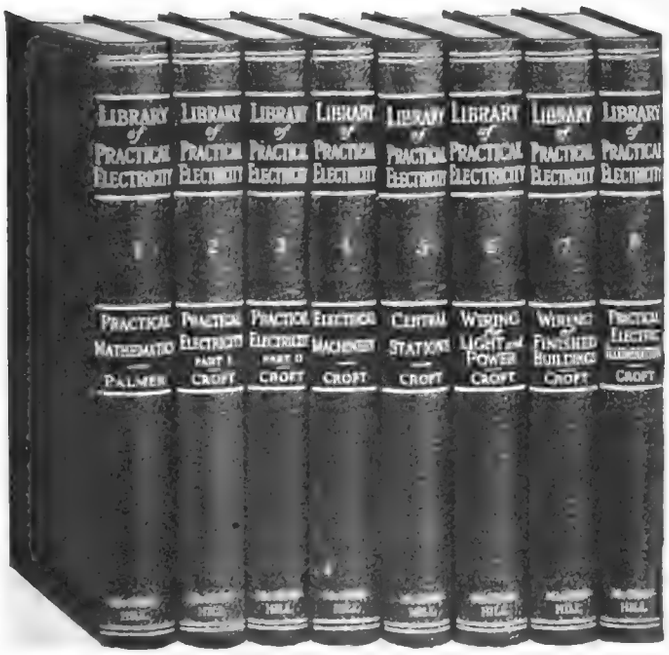


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| WABG | Arnold Edwards Piano Co., Jacksonville, Fla. | 10—248 |
| WABH | Lake Shore Tire Co., Sandusky, Ohio | 20—240 |
| WABI | Bangor Railway & Electric Co., Bangor, Maine | 50—240 |
| WABJ | The Radio Laboratories, South Bend, Ind. | 10—240 |
| WABK | First Baptist Church, Worcester, Mass. | 10—252 |
| WABL | Connecticut Agricultural College, Storrs, Conn. | 100—283 |
| WABM | F. E. Doherty Automotive & Radio Equipment Co., Saginaw, Mich. | 100—254 |
| WABN | Waldo C. Grover, LaCrosse, Wis. | 250—244 |
| WABO | Lake Ave. Baptist Church, Rochester, N. Y. | 10—252 |
| WBAA | Purdue University, West Lafayette, Ind. | 250—360 |
| WBAD | Sterling Electric Co., Minneapolis, Minn. | 100—360 |
| WBAH | The Dayton Co., Minneapolis, Minn. | 500—417 |
| WBAN | Wireless Phone Corporation, Paterson, N. J. | 100—244 |
| WBAO | James Millikin University, Decatur, Ill. | 50—360 |
| WBAP | Wortham-Carter Publishing Co. (Star-Telegram), Fort Worth, Texas | 750—476 |
| WBAV | Erner & Hopkins Co., Columbus, Ohio | 500—390 |
| WBAW | Marietta College, Marietta, Ohio. | 250—246 |
| WBAX | John H. Stenger, Jr., Wilkes-Barre, Pa. | 20—360 |
| WBAY | Western Electric Co., New York, N. Y. | 500—492 |
| WBBA | Newark Radio Laboratories, Newark, Ohio | 20—240 |
| WBBC | Sterling Radio Equipment Co., Sterling, Ill. | 50—229 |
| WBBD | Barbey Battery Service, Reading, Pa. | 50—234 |
| WBL | T & H Radio Company, Anthony, Kan. | 100—261 |
| WBS | D. W. May (Inc.), Newark, N. J. | 20—360 |
| WBT | Southern Radio Corp., Charlotte, N. C. | 500—360 |
| WBU | City of Chicago, Chicago, Ill. | 500—286 |
| WBZ | Westinghouse Electric & Mfg. Co., Springfield, Mass. | 750—337 |
| WCAD | St. Lawrence University, Canton, Ohio | 250—280 |
| WCAE | Kaufman & Baer Co., Pittsburgh, Pa. | 500—462 |
| WCAG | Clyde R. Randall, New Orleans, La. | 50—268 |
| WCAH | Entrekin Electric Co., Columbus, Ohio | 100—286 |
| WCAJ | Nebraska Wesleyan University, University Place, Neb. | 500—360 |
| WCAK | Alfred P. Daniel, Asst. Division Mgr., A. R. R. L., Houston, Texas | 50—360 |
| WCAL | St. Olaf College, Northfield, Minn. | 250—360 |
| WCAM | Villanova College, Villanova, Pa. | 150—360 |
| WCAO | The Sanders and Stayman Co., Baltimore, Md. | 50—360 |
| WCAP | Chesapeake & Potomac Telephone Co., Washington, D. C. | 500—469 |
| WCAR | Alamo Radio Electric Co., San Antonio, Texas | 150—360 |
| WCAS | Wm. Hood Dunwoody Industrial Institute, Minneapolis, Minn. | 100—246 |
| WCAT | South Dakota State School of Mines, Rapid City, S. D. | 50—240 |
| WCAU | Durham & Co., Philadelphia, Pa. | 250—286 |
| WCAV | J. C. Dice Electric Co., Little Rock, Ark. | 20—360 |
| WCAX | University of Vermont, Burlington, Vt. | 50—360 |
| WCAY | Kesselman O'Driscoll Co., Milwaukee, Wis. | 250—261 |
| WCAZ | Carthage College, Carthage, Ill. | 50—246 |
| WCBA | Charles W. Humbach, Allentown, Pa. | 5—280 |
| WCBB | K & K Radio Supply Co. (Charles H. Katzenberger), Greenville, Ohio | 100—240 |
| WCBD | Wilbur G. Voliva, Zion, Ill. | 500—345 |
| WCE | Findley Electric Co., Minneapolis, Minn. | 250—360 |
| WCK | Stix Baer & Fuller Dry Goods Co., St. Louis, Mo. | 100—360 |
| WCM | University of Texas, Austin, Texas | 500—360 |
| WCX | The Detroit Free Press, Detroit, Mich. | 500—517 |

(*Continued on page* 1026)


# How to Become a Marvel of Muscular Development

**You Can Develop Enormous Muscles with this Newest and Greatest Invention in Physical Culture Apparatus**

If you want to be a real strong man, if you want to build up a powerful, muscular body that will make you stand out among men, you can do it simply by using the McFadden Patented 10 Cable Progressive Exerciser, which can be instantly converted into two 5 cable progressive exercisers. Can be adjusted to give you as much resistance as you want up to 200 pounds.

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**ADJUSTABLE PATENTED HEAD-GEAR**
**Increases the size of your neck one inch in 30 to 90 days.**

This apparatus is simplicity itself and with it you can accomplish most wonderful results. It is adjustable and will fit any man or boy. By using it in connection with my Progressive Exerciser there is no reason why you cannot become just as strong as you want to be.

**12 Weeks Home Instruction Course FREE**

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## Apparatus of Simplicity and Perfection

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**NATIONAL**
**"GOLD-GRAIN"**
**DETECTOR**

**For Reflex and Crystal Sets**

**$1.00**

Actual Size
FOR PANEL MOUNTING

**Only One Tuning Control**
***All Wave Lengths***

**NATIONAL**
**MONODYNE**
PAT. TRADE MARK PDG.
**TUBE SET**
MODEL GT-1

**No Storage Batteries**

**$10.00**
Including Two Inductance Coils Without Tube

Uses but one dry cell tube, preferably WD-12, or any other standard dry cell tube. Local and distant broadcasting comes in clear and loud.

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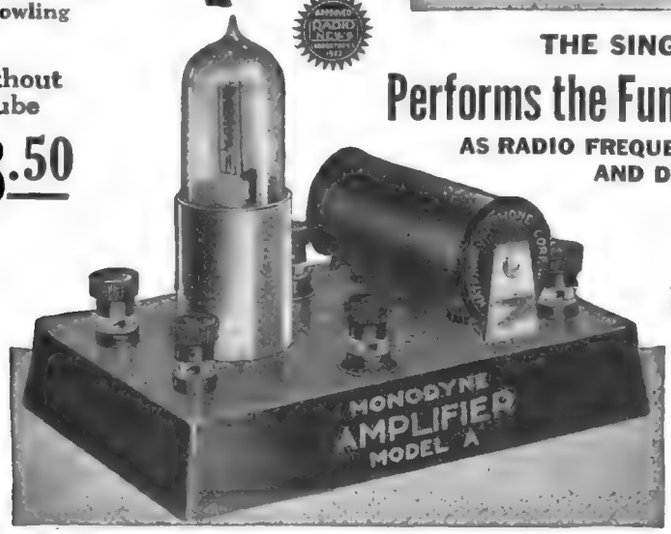
**AMPLIFIER**
**Designed for Amplification of MUSIC and VOICE**
**One or more Stages will operate a Loud-Speaker without distortion or howling**

**Without Tube**
**$8.50**

**THE SINGLE TUBE**
**Performs the Function of 2-Tubes**
**AS RADIO FREQUENCY AMPLIFIER AND DETECTOR**

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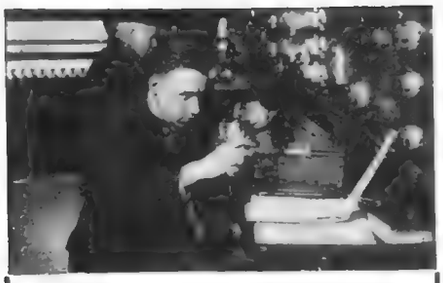

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## RADIO BROADCAST
(Continued)

| Call Letters | Name | Location | Power & Wave Length |
|---|---|---|---|
| WDAD | Central Kansas Radio Supply Co. (Wm. L. Harrison), | Lindsborg, Kan. | 10—360 |
| WDAE | Tampa Daily Times, | Tampa, Fla. | 250—360 |
| WDAF | Kanas City Star, | Kansas City, Mo. | 500—411 |
| WDAG | J. Laurance Martin, | Amarillo, Texas | 100—263 |
| WDAH | Trinity Methodist Church (South), | El Paso, Texas | 100—268 |
| WDAI | Hughes Radio Corp., | Syracuse, N. Y. | 100—246 |
| WDAK | The Courant, | Hartford, Conn. | 100—261 |
| WDAL | Florida Times-Union, | Jacksonville, Fla. | 100—360 |
| WDAO | Automotive Electric Co., | Dallas, Texas | 50—360 |
| WDAP | Board of Trade, | Chicago, Ill. | 500—360 |
| WDAR | Lit Bros., | Philadelphia, Pa. | 500—395 |
| WDAS | S. A. Waite, | Worcester, Mass. | 5—360 |
| WDAU | Slocum & Kilburn, | New Bedford, Mass. | 100—360 |
| WDAX | First National Bank (Appamoose County Farm Bureau), | Centerville, Iowa | 100—360 |
| WDAY | Radio Equipment Corp., | Fargo, N. D. | 50—244 |
| WDBC | Kirk, Johnson Co., | Lancaster, Pa. | 50—258 |
| WDBF | Robert G. Phillips, | Youngstown, Ohio | 50—261 |
| WDM | Church of the Covenant, | Washington, D. C. | 50—360 |
| WDT | Ship Owners' Radio Service, | New York, N. Y. | 500—405 |
| WDZ | J. L. Bush, | Tuscola, Ill. | 10—278 |
| WEAA | Frank D. Fallain Police Building, | Flint, Mich. | 150—280 |
| WEAB | Standard Radio Equipment Co., | Fort Dodge, Iowa | 500—360 |
| WEAF | American Telephone & Telegraph Co., | New York, N. Y. | 500—492 |
| WEAG | Nichols-Hineline-Bassett Laboratory, | Edgewood, R. I. | 10—231 |
| WEAH | Wichita Board of Trade, | Wichita, Kan. | 50—244 |
| WEAI | Cornell University, | Ithaca, N. Y. | 500—286 |
| WEAJ | University of South Dakota, | Vermillion, S. D. | 200—360 |
| WEAM | Borough of North Plainfield (W. Gibson Buttfield), | North Plainfield, N. J. | 100—252 |
| WEAN | Shepard Co., | Providence, R. I. | 100—273 |
| WEAO | The Ohio State University, Co- | lumbus, Ohio | 500—360 |
| WEAP | Mobile Radio Co., | Mobile Ala. | 100—360 |
| WEAR | Baltimore American News Publishing Co., | Baltimore, Md. | 50—360 |
| WEAS | Hecht Co., | Washington, D. C. | 50—360 |
| WEAU | Davidson Bros. Company, | Sioux City, Iowa | 100—360 |
| WEAY | Will Horwitz, Jr., | Houston, Texas | 250—360 |
| WEB | Benwood Co., | St. Louis, Mo. | 500—360 |
| WEV | Hurlburt-Still Electrical Co., | Houston, Texas | 50—360 |
| WEW | St. Louis Univ'ty, | St. Louis, Mo. | 100—261 |
| WFAA | The Dallas News, The Dallas Journal, | Dallas, Texas | 500—476 |
| WFAB | Carl F. Woese, | Syracuse, N. Y. | 200—234 |
| WFAF | H. C. Spratley Radio Co., | Poughkeepsie, N. Y. | 20—360 |
| WFAH | Electric Supply Co., | Port Arthur, Texas | 150—236 |
| WFAJ | Hi-Grade Wireless Instrument Co., | Ashville, N. C. | 50—360 |
| WFAM | Times Publishing Co., | St. Cloud, Minn. | 20—360 |
| WFAN | Hutchinson Electric Service Co., | Hutchinson, Minn. | 100—360 |
| WFAQ | Missouri Wesleyan College, | Cameron, Mo. | 10—360 |
| WFAT | The Daily Argus-Leader, | Sioux Falls, S. Dak. | 100—360 |
| WFAV | University of Nebraska, Dept. E. | E., Lincoln, Nebr. | 500—275 |
| WFI | Strawbridge & Clothier, | Philaphia, Pa. | 500—395 |
| WGAL | Lancaster Elec. Supply & Const. Co., | Lancaster, Pa. | 10—248 |
| WGAN | Cecil E. Lloyd, | Pensacola, Fla. | 50—360 |
| WGAQ | Glenwood Radio Corp., (W. G. | Patterson), Shreveport, La. | 100—360 |
| WGAR | Southwest American, | Fort Smith, Ark. | 20—360 |
| WGAU | Radio Mfg. & Service Co., (Marcus G. Limb), | Wooster, Ohio. | 20—226 |
| WGAW | Ernest C. Albright, | Altoona, Pa. | 100—261 |
| WGAY | North Western Radio Co., | Madison, Wis. | 100—360 |
| WGAZ | The South Bend Tribune, | South Bend, Ind. | 50—360 |
| WGI | American Radio & Research Corp., | Medford Hillside, Mass. | 500—360 |

(*Continued on page* 1028)

# Ten years, and *no breakdowns*

That's the record which James Bishop's Auto-Wheel Coaster has made. He says: "I have had an Auto-Wheel Coaster for ten years. Have hauled heavy loads most every day on rough ground, but the wagon went through it all without a breakdown."

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Superior construction makes Auto-Wheel Coasters sturdy. Bolsters of hard maple; mortised joints; self-contained roller bearings; hound brace; hand brake, special hub cap and locking pin; rubber-tired disc wheels (oversize tires on three largest), or steel-tired disc or wood spoke wheels.

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## Standard of Spanish Army Genuine Astra

**$7.75**

*Adopted by French During World War*

The finest European pistol—
**Drop Forged Blue Steel Throughout**—uses standard ammunition, an accurate, hard-hitting, brand-new weapon.

Bought before recent tariff raise. **Buy now from sole U. S. importers and save about ½ on these fine guns.**

**$7.75** 25 cal., 7 shot **ASTRA, C. O. Q. Automatic.**
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Guarantee states that tuition will be refunded if, upon graduation, position is not obtained for you, paying at least $110 per month and expenses.

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**Cord Tip Jack**
Takes place of binding posts. Cord tip firmly gripped by jack. Made of brass, nickel plated. Screw to attach lead wire. No soldering necessary.
F1500 Cord tip jack
Each .....$.15

**Phonehorn**
Base consists of Phonodapter into which fits a fine enameled fibre horn. Size of horn 12"; bell 6½". Slip Phonodapter end on a single telephone receiver.
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Base solid black composition. Automatic crystal holder. Triple adjustments. Smallest, neatest detector made. Radiocite crystal. 200,000 in use.
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No better Transformer made. Highest class materials. Impregnated coils. Silicon steel stampings used. Save 50 per cent by assembling it yourself.
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For Reinartz circuit, 300-600 meters. 19 taps. Size 4½" diam.; 1⅞" center opening. Coil is firm and will not fall apart.
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Best popular loud speaker. Fibre horn, heavy metal base, five ft. cord. Nickel goosenеck. Greatest tuned (adjustable) talker. Horn length 11½"; bell 6⅝"; total height 9".
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**Molded Variometer**
Highly substantial instrument. Silk windings. ¼" shaft. Flange B when placed into AB direction makes instrument panel mounting. 180 to 650 meters. Money back if this instrument is not all that we claim for it.
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**Fonekushions**
Made of sponge rubber. Make wearing your receivers a pleasure. Positively exclude all noises and make reception a pleasure. Sponge rubber will last for years. Light as a feather.
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Simplest and most practical type of condenser.
F4500 "Rico" Condenser .001 mfd. 43 plate capacity .....$1.75
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All types no dials $1.50

**Radio Frequency Transformers**
Best Radio Frequency Transformer developed so far. Designed by R. E. Lacault, Associate Editor RADIO NEWS. Air core type.
F2800 Transformer, size 7⅞"x2½" .....$1.50

**Spaghetti**
Varnished flexible cambric tubing. 319 takes No. 22 wire; 320 takes 18 to 20 wire; 21 takes 16 to 18 wire; 344 takes 22 to 28 wire.
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Smallest and handiest made. Fits any flat iron or percolator plug. Plug then becomes handle. 5" long. Complete but without plug or wire.
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**Formica Panels Clearance Sale**
As we are discontinuing these particular sizes, this material is now offered at cost. All 3-16" thick.
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Sold in 6" lengths only.
F6032 Rod 8-32" thread, length .....$.08
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F1425 Rod, plain ¼" round, length .....$.10
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Prices are per foot. ≡ equals.
F823 E No. 25 B&S $.02
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10 per cent discount in 100 foot lots.

**Copper Ribbon**
.005" thick.
F700 ⅝" wide; F701 ¼" wide; F702 3-16" wide.
All sizes per foot....$.01

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.001" thick. 4" wide.
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All our tin foils come 4" wide. Uniform product throughout.
Best grade only. F850 has 1500 sq. inches per lb.
F851 700 sq. inches to lb.
F850 Tin foil....lb $.35
F851 Tin foil ....lb .35

**Switch Knob**
F199 Knob. 1⅛" dia. height ⅝"; 8-32 screw.
F4451 has 8-32 or 10-32 bushing, no screw.
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F4451 Knob ..... .06

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Has central hole of 5-32", and seat to hold screw, dia. 1¼", height ⅝".
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With 8-32" bushing. Black composition.
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**Radiocite**
Best most sensitive mounted crystal. U. S. Navy using it. Each tested.
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Makes 3-16" dial fit ¼" shaft. ⅛" long.
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Made of hard wood, accurately turned. Takes any finish. Large hole 2" diameter. Width 2", diameter 3⅛", 2 shaft holes.
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High heat dielectric base. Come with tapered, knurled knob. 2⅛" dia. Complete with pointer.
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F4311 30 ohm ..... .65
F4312 Potentiometer, 200 ohms ..... .85

**Phone Plugs**
Sold from 75c. to $1.00 everywhere. Hard rubber composition shell and patented cord tip holder. Finest workmanship thruout.
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Octagon shape. Four nickel binding posts, phosphor bronze contact springs. Best brown bakelite.
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F6500 Tube Socket. Made entirely of composition. Best made. Each....$.35

**Condensers**
Best make, paper-impregnated condensers. Capacity guaranteed.
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All name plates brass with silver letters.
F839 (Right or left) $.10
F809 Comes in 35 styles. Any denomination, each style .....$.04
Panel Scale. 2½", 90°, metal, silver background, black lettering.
F715 Scale. Each ..$.15

**Binding Post Name Plates**
Dia. ⅞". These styles: Phones, Ground, —, Output, "A" Bat.—, "B" Bat.—, Loud Speaker, "C" Bat.—, Aerial, +, Input, "A" Bat.+, "B" Bat.+, Loop "C" Bat. +.
F6000 Name Plates all styles, each .....$.03

**"Rasco" Posts**
Made of black composition.
F650-51 Each .....$.08
F202 Has nickel-plated bottom, each ..... .08
Dozen, each style .... .90
F122 Initialed Binding Posts. Six popular styles. Each .....$.12

**Cord Tips**
Standard phone cord tips. nickeled.
F315 Each .....$.03

**Separable Cord Tips**
No solder required. Wire goes in ferrule. Shank holds it tight. Nickel plated.
F2900 Each .....$.06

## AUTOPLEX CIRCUIT

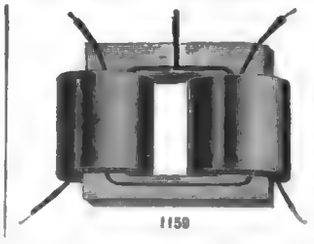
The famous Autoplex circuit described in RADIO NEWS has taken the country by storm. The only single tube outfit that works a loud-talker. Results guaranteed.

1—F714 Mahogany Cabinet, 7x14" .....$3.35
1—F7140 Dilectryte Panel 7x14" ..... 1.20
2—F5353 Moulded Variometers ..... 6.00
2—F3078 4" Dials ..... .50
1—F5014 1250 turn Honeycomb coil ..... 1.85
1—F8500 Vacuum Tube Socket ..... .35
1—F4310 6 ohm Rheostat ... .45
8—F201 "Rasco" Binding Posts ..... .80
8—Assorted Binding Post Name Plates ..... .16
5—F6400 Feet Bus Bar Wire .25
1—F5209 Consolidated Autoplex pattern ..... .50

Total $15.83

Our special price, Complete ..... $15.25

Complete with Melotone Loud-speaker ..... $20.00



1150

## New! New!!

Push Pull Transformer for many new circuits. See any radio magazine. Made of best materials. Coils impregnated. Silicon steel laminations. Save 50 per cent by assembling yourself. Simple instructions furnished. Fully Guaranteed.

F1159 Push Pull Transformer. Ratio 6½ to 1 .....$4.00

## 2 Stage Amplifier

1—F710 Mahogany Cabinet..$2.60
1—F7100 Dilectryte Panel .. .90
2—F1100 A.F. Transformers 4.00
2—F1100 Double Circuit Jacks 1.30
1—F1003 Rasco Plug ..... .55
2—F6500 Tube Sockets .... .70
2—F4311 30 ohm Rheostats.. 1.30
10—F6060 Post Name Plates .30
10—F201 Rasco Binding Posts 1.00
30 Ft. F6400 Bus Bar Wire .75
Blue Prints and directions... .50

Total, $13.90

**Our Price $13.50**

# RADIO SPECIALTY CO., 100 Park Place, New York City

**Factories: Brooklyn, N. Y. Elkridge, Md.**

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# Wins a Welcome

You are always welcome with a sweet-toned Buescher Saxophone. Thousands of men and women, of all ages, have found it a certain key to social popularity. For home entertainment, for church, school or lodge affairs, the Saxophone is the most popular and adaptable instrument. Saxophone players enjoy, also, many opportunities of earning money.

BUESCHER

## TRUE-TONE SAXOPHONE

The new Buescher Saxophone is a marvelous instrument. It is one of the most beautiful of all musical instruments—by the range and wealth of its tones it takes the place of almost every other instrument—yet it is so perfected and simplified that it is the easiest of all instruments to play.

### See How Easy It Is

With the aid of the first three lessons, which are sent free (upon request) with each new Saxophone, the scale can be mastered in an hour; in a few weeks you can be playing popular music. Practice is a pleasure because you learn so quickly. You can take your place in a band within 90 days, if you so desire.

### Try It In Your Own Home

You may order any Buescher Saxophone, Cornet, Trumpet, Trombone or other Band or Orchestral Instrument and try it six days in your own home, without obligation. Easy terms of payment may be arranged if preferred. Mention the instrument interested in and a complete catalog will be mailed free.

### Buescher-Grand Trumpet

Especially easy to blow, with an improved bore and new proportions. With the mute in, it blows so softly and sweetly that practice never annoys. A splendid home instrument.

### Free Saxophone Book

We have prepared a very interesting book on the history and development of the Saxophone. It tells which saxophone takes violin, cello and bass parts and many other things you would like to know. Also illustrates first lesson. Every music lover should have a copy. It is sent free on request. Just send your name for a copy.

**BUESCHER BAND INSTRUMENT CO**

Everything in Band and Orchestra Instruments

6017 Buescher Block, Elkhart, Indiana

Buescher Band Instrument Co.,
6017 Buescher Block, Elkhart, Ind.

Gentlemen:

I am interested in the instrument checked below:
Saxophone.... Cornet.... Trombone.... Trumpet....
(Mention any other instrument interested in)

Name .....

Street Address .....

Town ..... State.....


## RADIO BROADCAST
(Continued)

| Call Letters | Name | Location | Power & Wave Length |
|---|---|---|---|
| WGL | Thomas F. J. Howlette, Philadelphia, Pa. | | 500—360 |
| WGR | Federal Telephone and Telegraph Co., Buffalo, N. Y. | | 500—319 |
| WGV | Interstate Electric Co., New Orleans, La. | | 100—360 |
| WGY | General Electric Co., Schenectady, N. Y. | | 1000—380 |
| WHA | University of Wisconsin, Madison, Wis. | | 500—360 |
| WHAA | State University of Iowa, Iowa City, Iowa | | 100—283 |
| WHAB | Clark W. Thompson, Galveston, Texas | | 200—360 |
| WHAC | Cole Bros. Electric Co., Waterloo, Iowa | | 10—360 |
| WHAD | Marquette University, Milwaukee, Wis. | | 100—280 |
| WHAG | University of Cincinnati, Cincinnati, Ohio | | 200—222 |
| WHAH | Hafer Supply Co., Joplin, Mo. | | 250—360 |
| WHAI | Radio Equipment & Mfg. Co., Davenport, Iowa | | 50—360 |
| WHAK | Roberts Hdwe. Co., Clarksburg, W. Va. | | 15—258 |
| WHAL | Lansing Capital News, Lansing, Mich. | | 20—248 |
| WHAM | University of Rochester (Eastman School of Music), Rochester, N. Y. | | 100—360 |
| WHAP | Otta & Kuhns, Decatur, Ill. | | 50—360 |
| WHAQ | Semmes Motor Co., Washington, D. C. | | 10—360 |
| WHAR | Paramount Radio & Electric Co., (W. H. A. Paulus), Atlantic City, N. J. | | 10—231 |
| WHAS | Courier-Journal and Louisville Times, Louisville, Ky. | | 500—400 |
| WHAV | Wilmington Electrical Specialty Co., Inc., Wilmington, Del. | | 50—360 |
| WHAZ | Rensselaer Polytechnic Institute, Troy, N. Y. | | 500—380 |
| WHB | Sweeney School Co., Kansas City, Mo. | | 500—411 |
| WHD | West Virginia University, Morgantown, W. Va. | | 250—360 |
| WHK | Radiovox Co., (Warren R. Cox), Cleveland, Ohio | | 500—360 |
| WHN | George Schubel, New York, N. Y. | | 100—360 |
| WIAB | Joslyn Automobile Co., Rockford, Ill. | | 50—252 |
| WIAC | Galveston Tribune, Galveston, Texas | | 100—360 |
| WIAD | Howard R. Miller, Ocean City, N. J. | | 10—254 |
| WIAF | Gustav A. DeCortin, New Orleans, La. | | 10—234 |
| WIAH | Continental Radio & Mfg. Co., Newton, Iowa | | 10—258 |
| WIAI | Heer Stores Co., Springfield, Mo. | | 20—252 |
| WIAJ | Fox-River-Valley Radio Co., Neenah, Wis. | | 100—224 |
| WIAK | Journal-Stockman Co., Omaha, Neb. | | 200—278 |
| WIAO | School of Engineering of Milwaukee, Milwaukee, Wis. | | 100—360 |
| WIAQ | Chronicle Publishing Co., Marion, Ind. | | 10—226 |
| WIAR | Paducah Evening Sun, Paducah, Ky. | | 100—360 |
| WIAS | Home Electric Co., Burlington, Iowa | | 100—360 |
| WIAT | Leon T. Noel, Tarkio, Mo. | | 15—360 |
| WIAU | American Trust & Savings Bank, Le Mars, Iowa | | 20—360 |
| WIK | K & L Electric Co., McKeesport, Pa. | | 500—234 |
| WIL | Continental Electrical Supply Co., Washington, D. C. | | 10—360 |
| WIP | Gimbel Bros., Philadelphia, Pa. | | 500—509 |
| WJAB | American Electric Co., Lincoln, Neb. | | 500—360 |
| WJAD | Jackson's Radio Engineering Laboratories, Waco, Texas | | 150—360 |
| WJAF | Press Publishing Co., Muncie, Ind. | | 10—360 |
| WJAG | The Norfolk Daily News, Norfolk, Neb. | | 200—360 |
| WJAK | Clifford L. White, Greentown, Ind. | | 30—254 |
| WJAM | D. M. Perham, Cedar Rapids, Iowa | | 20—268 |
| WJAN | Peoria Star, Peoria, Ill. | | 100—280 |
| WJAQ | Capper Publications, Topeka, Kan. | | 100—360 |
| WJAR | The Outlet Co., (J. Samuels & Bro.), Providence, R. I. | | 50—360 |
| WJAS | Pittsburgh Radio Supply Co., Pittsburgh, Pa. | | 500—360 |
| WJAT | Kelley-Vawter Jewelry Co., Marshall, Mo. | | 10—360 |

(*Continued on page* 1030)


# MILLIONS

## *Listen in Daily*

*for the voice of the*

## "Man of Mystery"—

**J. Andrew WHITE**

The Premier Broadcaster of Them All Tells the Inside Story of Radio Exclusively to the Readers of

# SUCCESS

*"The Human Magazine"*

The first official statement ever issued by the "Man of Mystery." Millions have heard him for he has talked to the largest audience ever addressed by a human being. His popularity is tremendous — he has a larger personal "fan" mail than any of our American celebrities, not even excepting the movie favorites — but few have ever seen him.

An Amazing Story of the Experiences of the Man Who Has Humanized Radio Broadcasting.

His forecast of the miracles to come.

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Introduces "Soderess." A new wonder. A pure solder in paste form. Works like magic. Stops all leaks. For mending water buckets, cooking utensils, milk pails, water tanks, tin roofs—everything including granite ware, agate ware, tin, iron, copper, zinc, etc.

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Everybody buys. Housewives, mechanics, electricians, jewelers, plumbers, tourists, automobilists, etc. No leak too bad to repair. Just apply a little "Soderess," light a match and that's all. Put up in handy metal tubes. Carry quantity right with you. Write for money-making proposition.

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and we will send you free this 52 page catalogue of radio sets and parts. It also contains explanation of radio terms, map and list of broadcasting stations and much radio information, including an explanation of successful hook-ups and circuits.

You will be amazed at the low prices Ward's quote. A complete tube set having a range of 500 miles and more, including tube, head set, batteries, and antenna equipment, as low as $23.50.

This catalogue contains everything for the expert and amateur. Complete sets and every improved part for building sets, all the most up-to-date devices—at the lowest possible prices.

## Headquarters for Radio

Montgomery Ward & Co. is headquarters for Radio, selling everything direct by mail without the usual "Radio-profits." Why pay higher prices? Ward quality is the best and the prices will often save you one-third. Everything sold under our Fifty Year Old Guarantee—Your Money Back if You Are Not Satisfied. Write today for your copy of this complete 52-page Radio Book.

**Write to our house nearest you. Address Dept. 40-R**

**Chicago** **Kansas City** **Ft. Worth** **St. Paul** **Oakland, Cal.** **Portland, Ore.**

Established 1872

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**Brings You This Genuine Underwood Typewriter on 10 Days' FREE TRIAL**

***A perfect machine, complete in every detail. Read all about this great offer***

## Yes, We Will Positively Ship You

this splendid Underwood upon receipt of only $3.00. This is by far the most liberal typewriter offer that has ever been made on so perfect a machine. **Nearly two million** Underwoods have been made and sold, proving conclusively that it is superior to all others in appearance, mechanical perfection and all-round excellence.

### Ten Days' Free Trial

We want you to see for yourself that this is the typewriter you ought to have, and, therefore, we make our great free trial offer. You merely send us the three dollars deposit and we ship the machine for you to try for ten full days before you decide to keep it. If not satisfied, every penny of your money will be returned to you.

### Rebuilt Like New

Every Underwood we sell is rebuilt just like new. It is dismantled right to the very bottom, and remanufactured to make it just like a new typewriter, with new enamel, new nickel, new platen, new key rings, new type; a complete, perfect typewriter, with two-color ribbon, back spacer, stencil device, automatic ribbon reverse, tabulator, key shift lock, etc. **Impossible to tell it from a brand new Underwood,** either in appearance, durability or quality of work.

### Easy Monthly Payments

Our easy monthly payment plan makes it possible for YOU to own this splendid machine without having to pay out any big sum of money. You will hardly know you are paying for it. REMEMBER, you have the full use of the machine, just the same as though it was fully paid for.

### Over 325,000 Sold

Over 325,000 people have purchased and been satisfied with our product. What better proof could anyone ask of the perfection of our typewriters and the integrity of this firm!

### Your Money Back

Yes, you can have your money back if you want it. After you have examined the typewriter carefully, used it to write letters, if you decide for any reason whatever that you do not care for it, you may return it to us at our expense and every penny you have paid will be cheerfully and promptly refunded.

### No Obligation on Your Part

When you send in the coupon for either further information about our great typewriter offer or for the typewriter itself on our free trial plan, you are under no obligation whatever until after you have tried it and have decided for yourself that you want to keep it.

### Write Now for Our Big Typewriter Book

telling all about our great big typewriter factory. In this book we illustrate and describe all of the various processes of re-enameling, renickeling and assembling this splendid Underwood. It tells in an interesting way how **each part** is examined and tested carefully and thoroughly to insure the finished machine being one you will be proud to own.

***Write Right Today***
***Use Coupon Below***

**SHIPMAN-WARD MFG. CO.**
**2162 Shipman Bldg., Chicago**

Send me your big bargain catalog and complete details of your surprising offer, without obligation on my part.

NAME .....

.....

.....STATE.....


## RADIO BROADCAST
(Continued)

| Call Letters | Name | Location | Power & Wave Length |
|---|---|---|---|
| WJAX | Union Trust Co., | Cleveland, Ohio | 500—390 |
| WJAZ | Chicago Radio Laboratory, | Chicago, Ill. | 1000—273 |
| WJD | Richard H. Howe, | Granville, Ohio | 50—229 |
| WJH | Wm. P. Boyer Co., | Washington, D. C. | 50—273 |
| WJX | De Forest Radio Telephone & Telegraph Co., | New York, N. Y. | 500—360 |
| WJY | R. C. A., | New York, N. Y. | 500—405 |
| WJZ | R. C. A., | New York, N. Y. | 500—455 |
| WKAA | H. F. Paar, | Cedar Rapids, Iowa | 100—268 |
| WKAD | Charles Looff, (Crescent Park), | East Providence, R. I. | 10—240 |
| WKAF | W. S. Radio Supply Co., | Wichita Falls, Texas | 100—360 |
| WKAN | United Battery Service Co., | Montgomery, Ala. | 15—226 |
| WKAP | Dutee W. Flint, | Cranston, R. I. | 200—360 |
| WKAQ | Radio Corp. of Porto Rico, | San Juan, Porto Rico | 100—360 |
| WKAR | Michigan Agriculture College, | East Lansing, Mich. | 250—280 |
| WKAS | L. E. Lines Music Co., | Springfield, Mo. | 10—360 |
| WKAV | Laconia Radio Club, | Laconia, N. H. | 50—254 |
| WKAW | Turner Cycle Co., | Beloit, Wis. | 10—242 |
| WKAX | William A. MacFarlane, | Bridgeport, Conn. | 15—231 |
| WKAY | Brenau College, | Gainesville, Ga. | 10—280 |
| WKC | Joseph M. Zamoiski Co., | Baltimore, Md. | 20—360 |
| WKY | W. K. Y. Radio Shop, | Oklahoma City, Okla. | 100—360 |
| WLAC | North Carolina State College | Raleigh, N. C. | 750—360 |
| WLAG | Cutting & Washington Radio Corp., | Minneapolis, Minn. | 500—417 |
| WLAH | Samuel Woodworth, | Syracuse, N. Y. | 250—234 |
| WLAJ | Waco Electrical Supply Co., | Waco, Texas | 150—360 |
| WLAK | Vermont Farm Machine Corp., | Bellows Falls, Vt. | 500—360 |
| WLAL | Naylor Electrical Co., (Sim Naylor), | Tulsa, Okla. | 100—360 |
| WLAN | Putnam Hardware Co., | Houlton, Me. | 250—283 |
| WLAP | W. V. Jordon, | Louisville, Ky. | 15—360 |
| WLAQ | Arthur E. Schilling, | Kalamazoo, Mich. | 20—360 |
| WLAT | Radio & Specialty Co., | Burlington, Iowa | 10—360 |
| WLAV | Electric Shop, | Pensacola, Fla. | 15—254 |
| WLAW | Police Dept., | New York, N. Y. | 500—360 |
| WLAX | Putnam Electric Co., | Greencastle, Ind. | 10—231 |
| WLB | University of Minnesota, | Minneapolis, Minn. | 100—360 |
| WLW | Crosley Manufacturing Co., | Cincinnati, Ohio | 500—309 |
| WMAB | Radio Supply Co., | Oklahoma, Okla. | 100—360 |
| WMAC | J. Edw. Page (Olive B. Meredith), | Cazenovia, N. Y. | 200—261 |
| WMAF | Round Hills Radio Corp., | Dartmouth, Mass. | 100—500—360 |
| WMAH | General Supply Co., | Lincoln, Neb. | 100—254 |
| WMAJ | Drovers Telegram Co., | Kansas City, Mo. | 250—275 |
| WMAK | Norton Laboratories, | Lockport, N. Y. | 500—360 |
| WMAL | Trenton Hardware Co., | Trenton, N. J. | 50—256 |
| WMAN | First Baptist Church, | Columbus, Ohio | 10—286 |
| WMAP | Utility Battery Service, | Easton, Pa. | 50—246 |
| WMAQ | Chicago Daily News, | Chicago, Ill. | 250—448 |
| WMAV | Alabama Polytechnic Inst., | Auburn, Ala. | 500—250 |
| WMAY | Kingshighway Presbyterian Church, | St. Louis, Mo. | 100—280 |
| WMAZ | Mercer University, | Macon, Ga. | 50—268 |
| WMC | Commercial, | Memphis, Tenn. | 500—500 |
| WMH | The Precision Equipment Co., | Cincinnati, Ohio | 10—248 |
| WMU | Doubleday-Hill Electric Co., | Washington, D. C. | 100—261 |
| WNAC | Shepard Stores, | Boston, Mass. | 100—278 |
| WNAD | University of Oklahoma, | Norman, Okla. | 100—360 |

(*Continued on page* 1032)


# You Can Be A General Manager

## Wallace Rohrschneider

became General Manager of the Hustisford (Wisconsin) Electric Light and Power Company at 28 years of age. He took his training and got his start at the School of Engineering of Milwaukee, and advanced rapidly to his present splendid position.

## Why Don't You Get Into This Big Pay Field?

**The same kind of training that put Mr. Rohrschneider into the ranks of the highly-paid Electrical Specialists will qualify you for brilliant success in this fascinating field of unlimited opportunities. Come to America's Greatest Institution of Electrical Education.** Learn by actual practice in our big laboratories with their magnificent equipment, including motors, dynamos, switchboards, ignition and lighting systems, etc. **Recognized experts give you personal instruction every step of the way.**

## Earn Your Way Through This Great College

You **can earn money to help defray your expenses while** you are learning. Our wonderful co-operative plan brings an Electrical Career within the reach of every ambitious man. Our Free Employment Department secures positions for those students who wish to earn part or all of their expenses. In addition, **the Department will help you get a good position in the Electrical industry when your training is completed.**

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**Dept. S-I-B224, 415 Marshall St., Milwaukee, Wis.**

Please send me without any cost or obligation, full particulars of the electrical course I have checked and your big Free Book telling about your institution and how it will fit me for a big position in the electrical field. Also tell me about your Earn-While-You-Learn plan.

(Check courses interested in, and be sure to give your education.)

—**School of Practical Electricity**—6 months or 1 year course. Complete general course, covering entire electrical field.
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—**College of Electrical Engineering**—3 years' course. Regular collegiate work granting B. S. Degree. 14 High School units or diploma from our Institute of Electrotechnics required for entrance.
—**Commercial Electrical Engineering**—1 year course. Thousands of Trained Men wanted in this **new** profession. 14 High School units or diploma from our Institute of Electrotechnics required for entrance.
—**School of Automotive Electricity**—3 to 6 months. Covers all systems of starting, lighting, ignition, and storage batteries for automobiles, tractors, air-craft, etc. Intensive practical course.
—**Armature Winding and Motor Generator Repair Course**—3 to 6 months' course. Brief, but intensely practical, leading to well-paying positions.
—**Electrical Home-Service Training** with laboratory facilities, for those who cannot come to Milwaukee.

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**Street** .....

**City** ..... **State**.....

**Age** ..... **Education**.....


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# Has the Fountain of Youth Been Discovered — *At Last?*

**Is the Miracle of Rejuvenation an Accomplished Fact? Can we make Old Bodies Young—Weak Bodies Strong—Sick Bodies Well—Almost Overnight? Can We Banish Disease—Cheat the Advancing Years and Regain the Vigor and Vitality of Youth?**

IT sounds too amazing for belief. Think of it! A fountain where all may bathe and emerge reborn and vigorous! A fountain where aging, ailing, discouraged humanity may regain the health, strength and energy of youth.

Is it true? Can it be true? Christos Parasco, who has suddenly leaped from obscurity into the limelight as a discoverer, says yes. Dr. Benedict Lust, prominent New York Physician, and an expert on hydrotherapy, says yes. Bernarr Macfadden, world famous exponent and teacher of physical culture, says yes, as do many others who can speak with authority.

When this new, wonderful discovery is revealed, it promises to startle the world. Men and women who have made the tests say that "it has made them over." That it has freed them from the shackles of disease; that the years have slipped from their shoulders like a discarded cloak; that they are throbbing once more with energy, vigor and power.

## Treatment Amazingly Simple

So amazingly simple are the means employed that it comes as a revelation to all who hear of it.

When Dr. Lust first heard of it, he couldn't believe it. He said: "I know a lot about this kind of treatment. I've been administering it most of my life, but I have never struck anything like this."

Later, after he had personally observed its action on others, and finally tried it himself, he said, "There is nothing in any way comparable to this treatment. I am not exaggerating when I say that it made me, a man of sixty, feel twenty-five years younger.

"Then there is the case of Dr. Warsaw, who weighed 240 pounds and was not well. Also for a year he had had a stubborn bronchial trouble which had prevented him from singing. This was a great trial to him, for he had long been an accomplished singer.

"He took the new treatment for eight hours. At the end of that time he had lost fourteen pounds, and his waist measure had been reduced two inches. He was so light on his feet that he could leap over the table on which he had been lying. And—this is the *most wonderful part of it—he had his voice back.* With my own ears I heard him render the Prologue from Pagliacci perfectly. He is a man of seventy."

You owe it to yourself to learn all you can about this amazing discovery—which washes away your years, your ills, your aches, your extra pounds; which makes you feel the thrill of renewed desires and impulses, and tunes your body once more to the call of Youth.

## Get This Remarkable Book—FREE

Mr. Macfadden arranged with Dr. Lust to write a book covering every detail of the treatment. This book is not for sale. So anxious is Mr. Macfadden to put this priceless knowledge within the reach of everyone, that he has decided to give the book FREE with a four months' subscription to Physical Culture, beginning with the current issue.

The price of the four months' subscription is only $1.00. Simply fill in the coupon below, attach a dollar bill and send it today. Don't miss the great opportunity to learn the secret of renewed health, vigor and vitality. Remember, the 144 page book is FREE. Attend to this right away.

**Macfadden Publications, Dept. SI-2**
**1926 Broadway, New York**

Here's the dollar. Please enter my name for four month's subscription to Physical Culture, starting with the current issue, and send me the FREE 144-page book by Dr. Lust explaining in detail the marvelous treatment described above. Money back if not satisfied.

Name .....

Address .....

City ..... State .....

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**If you're earning less than $100 a week, GO INTO DRAFTING! I guarantee to train you AT HOME the JOB-WAY, with actual Drafting Room jobs. Send for my free book, find out about the wonderful opportunities to earn big money in this easy, fascinating business. Drafting Experts are close to the Boss, are first in line for promotion to Executive positions.**

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"JOB-WAY" training makes you a DRAFTING EXPERT quick because you learn to do actual JOBS with the same instruments you will use when employed at a big salary. To encourage you to START RIGHT NOW, I will give you with my course this complete EXPERT'S outfit FREE. Coupon brings complete information.

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.....

.....

..... State.....


## RADIO BROADCAST
(Continued)

| Call Letters | Name | Location | Power & Wave Length |
|---|---|---|---|
| WNAL | R. J. Rockwell, Omaha, Neb. | .... | 20—242 |
| WNAM | Ideal Apparatus Co., Evansville, Ind. | ..... | 500—360 |
| WNAN | Syracuse Radio Telephone Co., Syracuse, N. Y. | ..... | 100—286 |
| WNAP | Wittenberg College, Springfield, Ohio | ..... | 100—231 |
| WNAQ | Charleston Radio Electric Co., Charleston, S. C. | ..... | 10—360 |
| WNAR | C. C. Rhodes, Butler, Mo. | ..... | 20—231 |
| WNAS | Texas Radio Corp. & Austin Statesman, Austin, Texas | .... | 100—360 |
| WNAT | Lennig Bros. Co., (Fred'k Lennig), Philadelphia, Pa. | ..... | 100—360 |
| WNAV | People's Telephone & Telegraph Co., Knoxville, Tenn. | ..... | 500—236 |
| WNAW | Peninsular Radio Club, Fort Monroe, Va. | ..... | 5—360 |
| WNAX | Dakota Radio Apparatus Co., Yankton, South Dak. | ..... | 100—244 |
| WNJ | The Shotton Radio Mfg. Co., Inc., Albany, N. Y. | ..... | 55—360 |
| WOAA | Dr. Walter Hardy, Ardmore, Okla. | ..... | 100—360 |
| WOAC | Maus Radio Co., Lima, Ohio | .... | 50—266 |
| WOAD | Friday Battery & Elec. Co., Sigourney, Iowa | ..... | 10—360 |
| WOAE | Midland College, Fremont, Neb. | | 20—360 |
| WOAF | Tyler Commercial College, Tyler, Texas | ..... | 10—360 |
| WOAG | Apollo Theatre (Belvidere Amusement Co.), Belvidere, Ill. | .... | 100—224 |
| WOAH | Palmetto Radio Corp., Charleston, S. C. | ..... | 100—360 |
| WOAI | Southern Equipment Co., San Antonio, Texas | ..... | 500—385 |
| WOAJ | Ervins Electrical Co., Parsons, Kansas | ..... | 15—258 |
| WOAK | Collins Hdwe. Co., Frankfort, Ky. | ..... | 20—240 |
| WOAL | Wm. E. Woods, Webster Groves, Mo. | ..... | 500—229 |
| WOAN | Vaughn Conservatory of Music, Lawrenceburg, Tenn. | ..... | 150—360 |
| WOAO | Lyradion Mfg. Co., Mishawaka, Ind. | ..... | 50—360 |
| WOAP | Kalamazoo College, Kalamazoo, Mich. | ..... | 50—240 |
| WOAQ | Portsmouth Kiwanis Club, Portsmouth, Va. | ..... | 15—360 |
| WOAT | Boyd M. Hamp, Wilmington, Del. | ..... | 50—360 |
| WOAV | 2nd Battalion, 112th Inf. P. N. G., Erie, Pa. | ..... | 100—242 |
| WOAW | Woodmen of the World, Omaha, Neb. | ..... | 500—526 |
| WOAX | Franklyn J. Wolff, (Monument Pottery Co.), Trenton, N. J. | .. | 100—240 |
| WOAZ | Penick Hughes Co., Stamford, Texas | ..... | 100—360 |
| WOC | The Palmer School of Chiropractic, Davenport, Iowa | ..... | 500—484 |
| WOI | Iowa State College, Anes, Iowa | | 100—360 |
| WOK | Pine Bluff Co., Pine Bluff, Ark. | | 500—360 |
| WOO | John Wanamaker, Philadelphia, Pa. | ..... | 500—509 |
| WOQ | Western Radio Co., Kansas City, Mo. | ..... | 500—360 |
| WOR | L. Bamberger & Co., Newark, N. J. | ..... | 500—405 |
| WOS | Missouri State Marketing Bureau, Jefferson City, Mo. | ..... | 500—441 |
| WPAB | Pennsylvania State College, State College, Pa. | ..... | 500—360 |
| WPAC | Donaldson Radio Co., Okmulgee, Okla. | ..... | 200—360 |
| WPAD | W. A. Wieboldt & Co., Chicago, Ill. | ..... | 500—360 |
| WPAH | Wisconsin Dept. of Markets, Waupaca, Wis. | ..... | 250—360 |
| WPAJ | Doolittle Radio Corp., New Haven, Conn. | ..... | 10—268 |
| WPAK | North Dakota Agricultural College, Agricultural College, N. Dak. | ..... | 250—360 |
| WPAL | Superior Radio & Tel. Equipment Co., Columbus, Ohio | .... | 100—286 |
| WPAM | Auerbach & Guettel, Topeka, Kan. | ..... | 100—360 |
| WPAP | Theodore D. Phillips, Winchester, Ky. | ..... | 35—360 |
| WPAQ | General Sales & Engineering Co., Frostburg, Md. | ..... | 10—360 |
| WPAR | Ward Battery & Radio Co., Beloit, Kan. | ..... | 10—360 |
| WPAT | St. Patricks Cathedral, El. Paso, Texas | ..... | 20—360 |
| WPAU | Concordia College, Moorhead, Minn. | ..... | 20—360 |
| WPAZ | Dr. John R. Koch, Charleston, W. Va. | ..... | 20—273 |

(*Continued on page* 1034)

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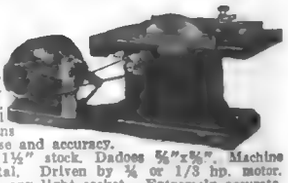

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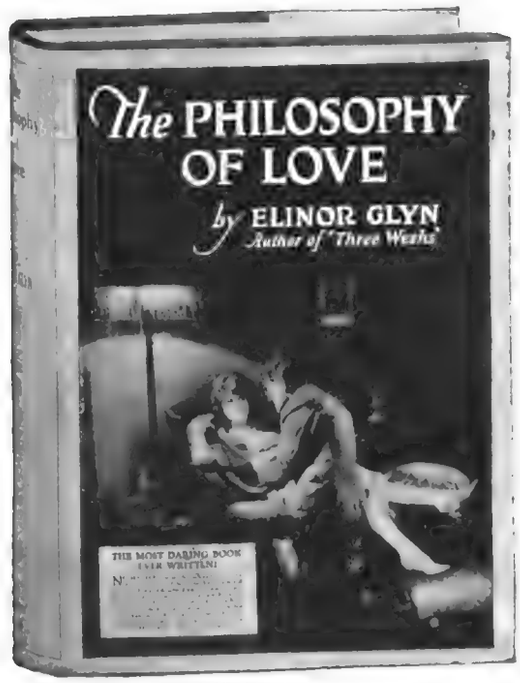


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Will you be able to hold the love of the one you cherish—or will your marriage end in divorce?

Do you know how to make people like you?

IF you can answer the above questions —if you know all there is to know about winning a woman's heart or holding a man's affection—you don't need "The Philosophy of Love." But if you are in doubt — if you don't know just how to handle your husband, or please your wife, or win the devotion of the one you care for—then you must get this wonderful book. You can't afford to take chances with your happiness.

## What Do YOU Know About Love?

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Do you know how to retain a man's affection always? How to attract men? Do you know the things that most irritate a man? Or disgust a woman? Can you tell when a man really loves you—or must you take his word for it? Do you know what you *MUST NOT DO* unless you want to be a "wall flower" or an "old maid"? Do you know the little things that make women like you? Why do "wonderful lovers" often become thoughtless husbands soon after marriage—and how can the wife prevent it? Do you know how to make marriage a perpetual honeymoon?

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| Call Letters | Name | Location | Power & Wave Length |
|---|---|---|---|
| WPG | Nushawg Poultry Farm, | New Lebanon, Ohio | 50—234 |
| WQAA | Horace A. Beale, Jr., | Parkesburg, Pa. | 500—360 |
| WQAB | Southwest Missouri State Teachers College, | Springfield, Mo. | 10—236 |
| WQAC | E. B. Gish, | Amarillo, Texas | 100—360 |
| WQAD | Whitall Electric Co., | Waterbury, Conn. | 50—242 |
| WQAE | Moore Radio News Station, | Springfield, Vt. | 50—275 |
| WQAF | Sandusky Register, | Sandusky, Ohio | 5—240 |
| WQAH | Brock-Amerson Electrical Eng. Co., | Lexington, Ky. | 10—254 |
| WQAI | Coles County Telephone & Telegraph Co., | Mattoon, Ill. | 10—258 |
| WQAM | Electrical Equipment Co., | Miami, Fla. | 100—360 |
| WQAN | Scranton Times, | Scranton, Pa. | 100—280 |
| WQAO | Calvary Baptist Church, | New York, N. Y. | 100—360 |
| WQAQ | West Texas Radio Co. (Abilene Daily Reporter), | Abilene, Texas | 100—360 |
| WQAS | Prince-Walter Co., | Lowell, Mass. | 100—266 |
| WQAV | Huntington & Guerry (Inc.), | Greenville, S. C. | 15—258 |
| WQAW | Catholic University, | Washington, D. C. | 5—236 |
| WQAX | Radio Equipment Co., | Peoria, Ill. | 10—360 |
| WQAZ | Greensboro Daily News, | Greensboro, N. C. | 30—360 |
| WRAA | Rice Institute, | Houston, Texas | 200—360 |
| WRAD | Taylor Radio Shop, | Marion, Kansas | 10—248 |
| WRAF | The Radio Club (Inc.), | Laporte, Ind. | 10—224 |
| WRAH | Stanley N. Read, | Providence, R. I. | 10—231 |
| WRAL | Northern States Power Co., | St. Croix Falls, Wis. | 100—248 |
| WRAN | Black Hawk Electrical Co., | Waterloo, Iowa | 10—236 |
| WRAO | Radio Service Co., | St. Louis, Mo. | 100—360 |
| WRAP | Winter Park Electrical Construction Co., | Winter Park, Fla. | 20—360 |
| WRAU | Amarillo Daily News, | Amarillo, Texas | 10—360 |
| WRAV | Antioch College, | Yellow Springs, Ohio | 100—360 |
| WRAW | Avenue Radio Shop, | Reading, Pa. | 10—238 |
| WRAX | Flaxons Garage, | Gloucester City, N. J. | 100—268 |
| WRAY | Radio Sales Corp., | Scranton, Pa. | 100—280 |
| WRAZ | Radio Shop of Newark, (Herman Lubinsky), | Newark, N. J. | 50—233 |
| WRC | Radio Corp. of America, | Washington, D. C. | 500—469 |
| WRK | Doron Bros. Elec. Co., | Hamilton, Ohio | 200—360 |
| WRL | Union College, | Schenectady, N. Y. | 500—360 |
| WRM | University of Illinois, | Urbana, Ill. | 500—360 |
| WRR | City of Dallas Police and Fire Signal Dept., | Dallas, Texas | 20—360 |
| WRW | Tarrytown Radio Research Laboratory (Koenig Bros.), | Tarrytown, N. Y. | 150—273 |
| WSAB | South East Missouri State Teachers College, | Cape Girardeau, Mo. | 100—360 |
| WSAC | Clemson Agricultural College, | Clemson College, S. C. | 500—360 |
| WSAD | J. A. Foster Co., | Providence, R. I. | 100—261 |
| WSAG | City of St. Petersburg, (Loren V. Davis), | St. Petersburg, Fla. | 10—244 |
| WSAH | A. J. Leonard, Jr., | Chicago, Ill. | 500—248 |
| WSAI | United States Playing Cards Co., | Cincinnati, Ohio | 500—309 |
| WSAJ | Grove City College, | Grove City, Pa. | 100—360 |
| WSAK | Foster Egner, (Daily News Pomeroy, O.), | Middleport, Ohio | 70—258 |
| WSAL | Franklin Electric Co., | Brookville, Ind. | 10—246 |
| WSAN | Allentown Radio Club, | Allentown, Pa. | 10—229 |
| WSAP | Seventh Day Adventist Church, | New York, N. Y. | 250—360 |
| WSAR | Doughty & Welch Elec. Co., | Fall River, Mass. | 10—254 |
| WSAT | Donohoo-ware Hardware Co., | Plainview, Texas | 20—268 |
| WSAW | John J. Long, Jr., | Canadaigua, N. Y. | 100—275 |

(*Continued on page* 1040)

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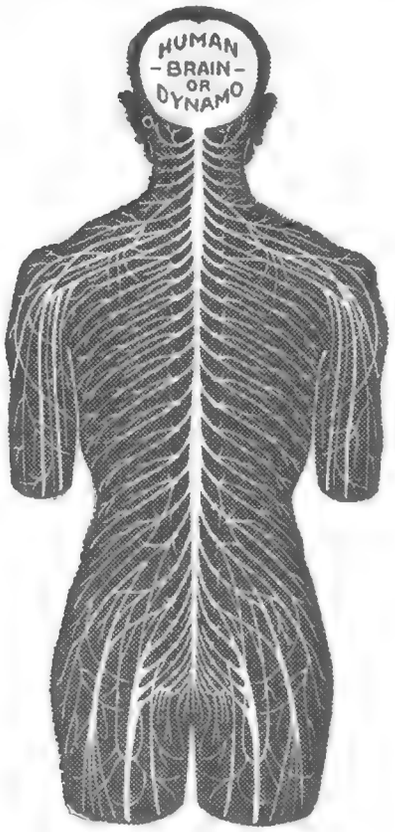
# What Do Chiropractors Mean by Innate Intelligence ?

THE temperature of a normal human body is approximately 98.6 degrees. You may sit in a room the temperature of which is 80 degrees, or go out of doors when the thermometer registers zero and your temperature, if you are in health, will not vary a single degree, because, resident in your body is an intelligence that generates, distributes and regulates the heat of the body, and instantly adapts it to the change in temperature.

If you start in June to take a plunge in the lake every morning and continue it every day until December, this same power resident in the body will intelligently adapt the body to the seasonal change in temperature.

This innate power gave the polar bear his long hair, that he might live in the land of eternal ice, and the gentle deer his speed, that he might escape his less swift foe. It is this power that in the struggle for existence gave wings to the birds and cunning to the fox, spots to the leopard and strength to the lion. It is this power that elongated the neck of the giraffe so that he could reach the high-hanging foods and for obvious reasons webbed the feet of the duck and goose. This inborn power adapted the stomach of the carnivora to a meat diet, the stomach of the herbivora to a vegetable diet, and the stomach of man to both.

This power develops the body from a blastoderm to its full growth in thirty-five years; for ten or more it maintains its vigor and then slowly lets the house in which we live decay. During all the circling three-score years and ten it coordinates the physical functions, heals the body's wounds, mends its breaks, adapts it to the change of season, occupation and pursuit and performs the miracle of changing common food into living, breathing, sensate bone and flesh.




**DEFINITION**

The practice of Chiropractic consists of the palpation and adjustment, with the hands, of the movable segments of the spinal column to normal position for the purpose of releasing the prisoned impulse.

It laughs at all our efforts to locate it or to imitate its work and yet some people, because they cannot find it, weigh it or measure it, question its existence and say "Vital force is a chemical phenomenon."

Call it what you will, it's there—a rose by any other name is just as sweet.

This "power within" Chiropractors call Innate Intelligence and all their philosophy, science and art is built upon this fundamental fact. They teach that "Innate Intelligence" functions through the brain and nervous system, and that disease is but the abnormal expression of one or more of the nine primary physical functions. Any pressure of a harder tissue (bone) upon the soft nervous tissue, impairs the conductivity (function or work) of that tissue and results in disease. All that is necessary for a complete restoration to health, is that the impinging tissue be adjusted to normal position, which permits the nerve again to function normally.

Scientists call the modus operandi of the "power within" the law of adaptation. Among the professions engaged in getting the sick well, chiropractors alone recognize the existence of the thing itself, and the law of its expression, through the nervous system.

That is the reason Chiropractic succeeds where other methods fail.

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**Should advice be desired by mail a nominal charge of $1.00 is made for each question. Sketches and descriptions must be clear and explicit. Only one side of sheet should be written on.**

**NOTE:—Before mailing your letter to this department, see to it that your name and address are upon the letter and envelope as well. Many letters are returned to us because either the name of the inquirer or his address is incorrectly given.**

### RAILROAD CROSSING SAFETY DEVICE.

(774) J. A. Pickens, Easley, S. C., has designed a railroad crossing safety system, which comprises a large mound to be erected at the center of the road, diverting truck traffic and causing the driver to "go slow" in making the crossing.

A. Your suggestion for a railroad crossing is not always feasible, as there are so many places where such a large crossing detour could not be employed. Furthermore, diversion of truck traffic, as well as horse and wagon traffic, is not a very good suggestion, as a team ordinarily having a straight haul finds it a good deal easier to get across the railroad tracks than in places where sharp turns are necessary. It makes it very difficult to remove wreckage from such a crossing, and in general, instead of improving the safety of the crossing, acts oppositely. The railroad right of way must be increased in size and cost of the installations are much greater than if the entire road were elevated or depressed above or below the street level. We do not advise that you apply for a patent on this suggestion.

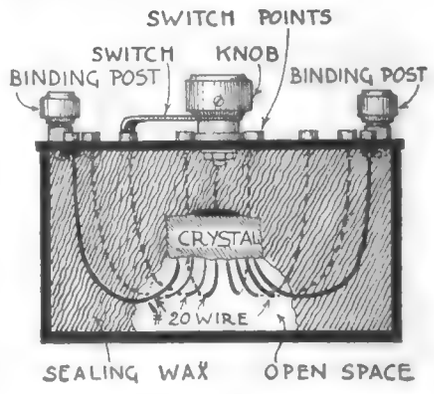
### WHY WE DO IT

(775) John C. Clark, New York City, asks why it is that so many of the opinions printed in this column are adverse to the inventor and why the Editor of this column does not advise more inventors to attempt to secure patents upon their ideas.

A. The purpose of this department is to stop inventors from making foolish mistakes. It is to teach them the right way to go about securing a patent and apply for patents on those things of value which are almost assured of acceptance. Of course, even the best article may never be placed upon the market due to the fact that the inventor expects to either secure too much for the patent rights, or that he does not handle the project in the proper manner. In other words, he may be a good inventor, but a poor business man. A great many of our decisions are, however, favorable. In fact, we should judge that thousands of favorable decisions have been given. Many of the inventors courteously enough write to the Editor of this department and let him know that their invention has been sold, or that changes have been made in the plans, so as to make the device more marketable. The Editor of this department has received quite a number of letters claiming that inventions have been sold in some cases for thousands of dollars. These letters further advise that the individuals followed comments or suggestions made here. Few of these letters are printed. Many of the good suggestions are kept on file, giving the inventor ample opportunity to proceed with any improvement he may desire, or permitting him to file his claims. None of the letters on which personal advice is given are published, consequently this limits the number of queries which are published. Do not for one moment suppose that all of our criticisms are adverse. Whenever we can conscientiously give favorable comment upon an idea we do so, even if we modify that favorable opinion.

### CRYSTAL DETECTORS

(776) Clyde D. Pace, Detroit, Mich., submits two diagrams of crystal detectors, the first of which is quite ordinary, and the other a multi-point detector.

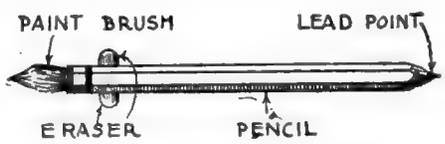



**Cost and difficulty of construction are the main objections to this device.**

**A. The first suggestion of a crystal detector is not new at all, and we do not believe that you could secure any basic patent upon the idea whatever. The second idea is a little more novel, but presents many difficulties in manufacturing. For this reason, we would advise that you build a dozen or more of these detectors, and attempt to place them upon the market, perhaps through one of your local radio stores. You will find that in order to adjust the detector each individual point will have to be sealed to the crystal, one at a time, and tested for sensitivity before being sealed. This will present innumerable difficulties in manufacturing, as before stated. In addition, the switching arrangement is expensive, and after all of the twenty points of the crystal have been burned out it can be practically thrown away, there being no method of changing or replacing it. We would be very skeptical about advising you to apply for a patent upon the idea.**

### COMBINATION PENCIL, PAINT BRUSH AND ERASER

(777) Ralph M. Williams, Oberlin, Ohio, submits a design of a pencil, paint brush and eraser and requests our opinion.




**A quite useless combination.**

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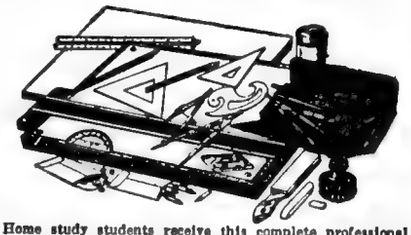

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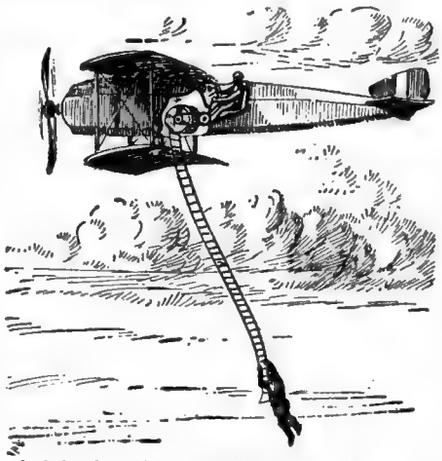
A. We do not doubt but that you could obtain a patent on your combination pencil, eraser and paint brush, but we would not suggest such patent inasmuch as we do not believe that you could ever realize a value commensurate with the time and money spent in patenting the same or in attempting to place it upon the market. The practical utility of the device is extremely limited.

### AIRPLANE LADDER

(778) Harvey Witter, Harrisburg, Pa., submits a design for an airplane ladder which will hoist a man up to the cock-pit of an airplane when he grasps the same.



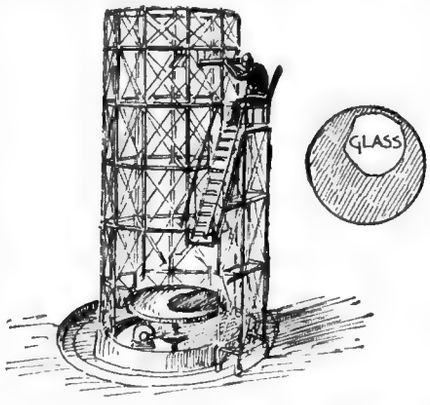
A device for which no practical use can be found.

A. Your suggestion for an airplane ladder is absolutely worthless. It is just as simple for a man to climb up a ladder suspended from an airplane, as it is to hoist him up into safety.

Besides, the number of individuals "hopping" on this ladder from the ground when the airplane is in motion is very limited indeed. Perhaps one movie actor does so once in his lifetime. Often no attempt is made to ruin his features, and a substitute is employed.

### TELESCOPIC REFLECTING MIRROR

(779) L. F. Wright, Buffalo, N. Y., asks our advice on a reflector for telescopes made of a large metallic disk with a piece of glass secured to it. The whole is to be rotated at high speed. His other suggestion is to make use of many pieces of glass welded together.




An impractical method of making large telescopes.

A. It is quite impossible to mold together a whole series of small pieces of glass as suggested by you in your recent communication. There is a concern making metal reflectors which they are placing on the market. Those reflectors are just as efficient as the glass reflectors, and may be made in larger sizes. Neither of your suggestions for the use of glass is applicable to telescopic construction, because it would be impossible to weld this glass together without producing air bubbles, crevices or cracks, which are naturally developed in attempted welding processes to a more marked degree than elsewhere.

Mounting pieces of glass upon a large metallic area makes it difficult to grind the glass down, because of the different hardness of the two substances. Of course, an attempt at this would probably be partially satisfactory, and if the entire device were rapidly rotated, some results would be obtained, but they would not be as satisfactory as with those reflectors now employed.

Although your suggestion could be illustrated and probably made the topic of a small feature article, its [illegible] possibilities are practically negligible, and, therefore, not advise any attempt [illegible] idea.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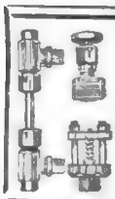

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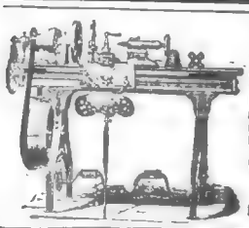

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## The Heavens in February

By ISABEL M. LEWIS, M.A.

(*Continued from page* 992)

pendent for its splendor upon nearness as is the case with Sirius. Compared with this glorious giant star Sirius is but a pigmy.

Procyon, the first-magnitude star in Canis Minor, The Lesser Dog, nearly due east of Betelgeuse, is also a near neighbor of the solar system at a distance of about twelve light years. Both Sirius and Procyon are attended by massive but extremely faint companion stars. Due north of Procyon are the Twins; Castor and Pollux, in Gemini. Pollux is the brighter of the two stars at the present time but there is reason to believe that the relative brightness of the two stars has changed for Pollux is known as Beta, and Castor as Alpha, Geminorum and it was the custom of the ancients to name the brightest star in a constellation Alpha, the second in brightness Beta and so on. The distance of Pollux is about thirty-five light years, that of Castor about forty-five light years from the earth. Castor is the more interesting of the two stars for it is a double star in which each of the two components has a close companion star, making in all a system of four suns. The two principal stars have a long period of revolution about their common center of gravity that at least several centuries are required to complete.

To the northwest of Gemini is Auriga The Charioteer, with its brilliant Capella, The Sea-Goat with The Giedi or Kids, the three faint stars forming a small triangle, close by. Capella is one of the three brightest stars of the northern hemisphere, the other two being Vega and Arcturus.

The Unicorn lies east of Orion and south of Gemini. This group consists of faint stars and are of no particular interest, while it would strain the imagination to see in them any resemblance to the animal they are supposed to represent.

Monoceros is located, in one of the most brilliant portions of the Milky Way which at this time of year stretches from the large and brilliant southern constellation of Argo Navis, a small portion of which now appears in the southeast, in a broad band nearly through the zenith to the northwestern horizon. Another brilliant cloud of the Milky Way lies half-way between Perseus and Cassiopeia and in this cloud is the famous cluster of the "Sword Handle of Perseus" a fine object even for a small telescope. Nearly all of the constellation of Perseus lies within the Milky Way in a particularly rich portion. This luminous band composed of the blended light of countless stars too distant to be seen as individual points of light is one of the most beautiful features of the brilliant winter skies as it arches high overhead in this part of its course. It is hopeless to look for it under the glaring lights of our city streets, however. To see the Milky Way in all of its beuaty and magnificance one must get out in the open away from all lights except those supplied by the heavens alone on clear, dark moonless nights.

Venus, the most brilliant of all the planets, is now a magnificent object in the evening sky, setting about three hours after the sun the first of February.

Mars, Jupiter and Saturn are still in the eastern heavens visible to the early riser.


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| WSAZ | Chase Electric Shop, | Pomeroy, Ohio | 50—258 |
| WSB | Atlanta Journal, | Atlanta, Ga. | 500—429 |
| WSL | J. & M. Electric Co., | Utica, N. Y. | 100—273 |
| WSY | Alabama Power Co., | Birmingham, Ala. | 500—360 |
| WTAB | Fall River Daily Herald Pub. Co., | Fall River, Mass. | 10—248 |
| WTAC | Penn. Traffic Co., | Johnstown, Pa. | 150—360 |
| WTAD | Robert E. Compton, (First Presbyterian Church), | Carthage, Ill. | 10—229 |
| WTAF | Louis J. Gallo, | New Orleans, La. | 20—242 |
| WTAG | Kern Music Co., | Providence, R. I. | 10—258 |
| WTAH | Carmen Ferro, | Belvidere, Ill. | 10—236 |
| WTAJ | The Radio Shop, | Portland, Me. | 50—236 |
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| WTAM | Willard Storage Battery Co., | Cleveland, Ohio | 1000—390 |
| WTAN | Orndoff Radio Shop, | Mattoon, Ill. | 100—240 |
| WTAP | Cambridge Radio & Elec. Co., | Cambridge, Ill. | 50—242 |
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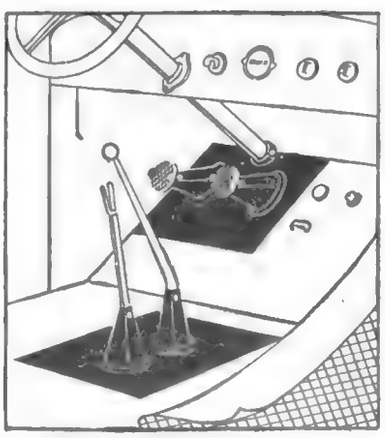

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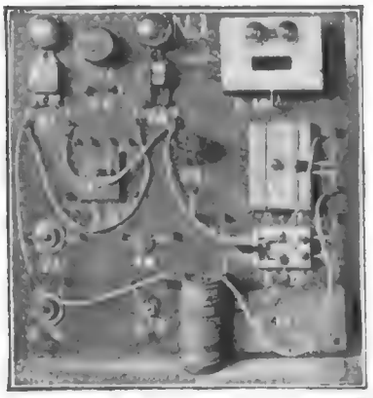

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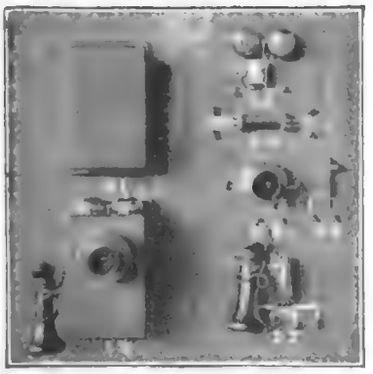

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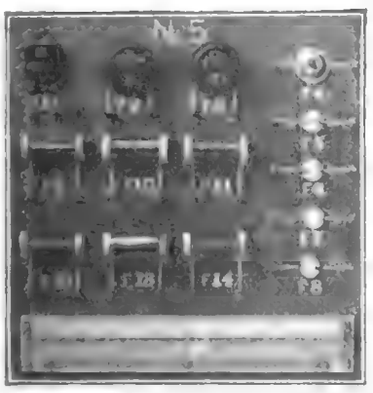

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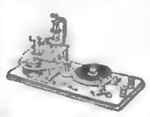

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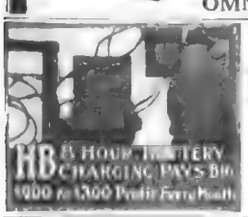


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**THE MAN ON THE METEOR**
**By Ray Cummings**
**Part II**
(*Continued from page* 971)

orating from her shoulders; she had been in the stream. A few molluscs, or something of the kind, lay at her feet.

"See!" she cried triumphantly. "They are to eat. My man Nemo can get them—they are in the water."

I broke them open and ate one. It was good. I kissed her approvingly and her arms clung about my neck. Nona always was happiest in my approbation; she seemed to think of nothing save how to win it.

When her caresses were passed, I stood up.

"How do I get them?" I demanded. "Nona must show me once—then I will get very many of them for us to eat."

The experience that followed was extraordinary; that is to say it would be so to you here on Earth. To me, that day on the meteor, it was merely frightening. Nona led me to the stream and we waded into it waist deep. I had bathed here, but I had never been further along. Nona had, however. She led me forward to where the water went under a low archway of our cave and thence into the bowels of the meteor.

The river-bed under my feet began sloping downward. The water deepened around me—to my chest, shoulders, almost to my neck. I was terrified. I pulled back from Nona's hand which was drawing me along. Her hair was floating out like golden seaweed around us. The milk-white water was under her uptilted chin.

Her eyes smiled at me tenderly. "No," she said. "My man Nemo never can he be afraid."

Afraid! I could not let her see that. I grunted scornfully, and we went forward.

The water rose to my own chin. We were well underground now—the ceiling of this subterranean passageway was hardly a foot above my head. In front of me I could see where the ceiling touched the water.

Suddenly I remembered Nona. One of her hands still held mine—the other was braced against a projection of the side wall to hold us against the gentle current that pressed us forward. The water now almost reached the top of her head. I could see her face beneath the surface. Her mouth was opened round and wide; a stream of air bubbles came gurgling up from it. Her chest was expanding and contracting rhythmically and swiftly, seemingly with great effort, like a man panting after an exhausting fan. *She was breathing the water!*

### II

I stared at Nona silently. The air bubbles from her mouth grew less, until soon there were almost none of them. The tidal air in her lungs had been forced out; water had taken its place. Through her opened mouth she was drawing in the water and expelling it—rapid respirations taxing the intercostal muscles almost to their limit.

Nona smiled up at me through the water, which in spite of its milk-white color, was curiously limpid and transparent. I felt the tug of her hand; I stepped forward, and in the deepening water my face went under.

Whatever may have been my previous existence, an experience such as this quite evidently was no part of it. My instinct was to hold my breath. I did so until I could no longer. I struggled against Nona's hand and tried to get my head above the surface. But she held me; and my fear of having

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her know me to be afraid was greater than my fear of the water.

### BREATHING WATER

At last I let out my pent-up breath. It gurgled from my mouth in bubbles. Then, in a gulp of desperation, I inhaled. The water choked me. I tried to cough; but could not—or at least the cough became my exhalation.

My ears were roaring as though the torrents of your Niagara were rushing past them. My head and chest seemed bursting—icy cold at first, then burning with fire.

My eyes were open. I was standing beside Nona and she was looking up at me. Through the half-light of the water I could see her almost as plainly as through air. She smiled encouragingly at me, and I tried to smile back.

I was drawing the water in and out swiftly now, with my mouth held extended like an expiring fish. It was a tremendous effort, this respiration. The muscles of my chest and diaphragm were tired in a moment. A weight in my chest seemed smothering my heart; I seemed on fire inside—a million inflamed little lung passages rebelling at this unaccustomed medium.

Spots were dancing before my eyes. I was losing consciousness through lack of oxygen. The poisoned venous blood was dulling my brain.

Then I began to feel better. I was respiring now almost as swiftly as Nona, and with far less effort than I had used at first.

You are skeptical? Because *you* cannot breath your Earth-water, you assume that *I* could not breathe this water on my meteor. What quaint logic that is! Yet I find all you Earth-people think on similar lines. It is your inadequate mentality, I suppose, so I must hasten to enlighten you.

There are two fundamental objects of respiration. First: the introduction into the system of oxygen by which the products resulting from the disintegration of the muscular, nervous and other tissues of the body may be converted into compounds easily eliminated. Secondly: the direct removal of the most noxious and therefore most important of these waste products—carbonic acid gas.

In man, as you know him on Earth, this is accomplished by the lungs. The venous blood, charged with its carbonic acid and its waste products, needing a renewal of oxygen and a removal of the carbonic acid, is pumped by the heart through the lungs. These by their construction present an immense amount of internal surface covered by a vascular net-work, through which the blood flows in innumerable minute streamlets.

In respiration, the inhaled air is separated from the blood only by an extraordinarily thin membrane—less than 1/20,000 of an inch in thickness. Through this membrane the blood absorbs oxygen from the air, giving in return to the air its noxious carbonic acid gas.

Such is the basic process in you Earthmen. In the case, let us say, of your Earth-fishes breathing your water, there is little fundamental difference. The blood in their gills is brought practically into contact with a steadily moving stream of water. But fishes do not get their oxygen from the water in some mysterious fashion. Did you think they did? They get the oxygen, not from water, but from air—the air that is held in solution in the water.

But for two things, you on Earth could breathe your water. First, your lung passages are too minute to receive a substance so heavy, so *unvolatile*, let me say, as is the water of Earth. Secondly, there is not proportionally enough air in your water.

Both these conditions were different on my meteor. You ask perhaps, are my lungs

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the same as yours? I think so, but I do not know. At my death you of Earth will find out, for I have willed my organs to your scientific men.

### HOW IT WAS POSSIBLE

But this I do know: this water on my meteor was very different from water as you know it. I have already said it was light and thin. To be exact, I estimate that on your Earth it would have a specific gravity of no more than .18, placing your water at 1.00.

In your sea-water a normally fleshy man will float with a small margin to spare. This water on my meteor was not saline; but more than that, Nona and I stood submerged in it with hardly any perceptible feeling of buoyancy.

Let me make my point still clearer. The low specific gravity of this water compared to yours was principally caused by the large amount of air it held in solution. It was, in a word, highly aerified to an extent proportionally eleven times more than is your average water on Earth. For this reason, my lungs needed but one-eleventh the amount of it from which to secure the necessary oxygen.

On Earth, your normal respiration varies widely; sixteen to twenty times per minute for a healthy adult at rest might be taken as a fair average. I was breathing this water at approximately eighty respirations per minute.

I do not know how long I stood there under the surface with Nona before I attained a semblance of normality. But gradually the burning in my chest and the smothering of my heart subsided. My brain cleared.

I looked about me curiously. The water was clear and transparent to a remarkable degree. There seemed inherent light diffused through it, like a phosphorescence.

We had taken several steps forward and were well below the surface now. Underneath my feet was a sandy soil. To the right and left were rocky walls—the sides of the submerged tunnel. And ahead lay open water, dim in the distance, with the narrow sandy floor sloping downward like a path down a hillside.

Everything was slightly blurred in outline. Nona's hair floated out and above her. The freedom of movement we had had in the air above was gone. We were hampered in moving by the friction of the water.

But it was nothing like the friction of walking in your water. Indeed, it was far more like your Earthly existence on land. Often now, on an oppressively heavy, foggy day here on Earth, I am reminded of it.

I am very specific in detailing these sensations. You will see why in a moment; you will see that this experience was the means of saving both our lives—Nona's and mine—and projecting us into a new era of my existence.

For after the very next time of sleep, the catastrophe to our tiny world overtook us.

### III

We found our molluscs and struggled back up the sloping path to shallow water. On the bank I lay and coughed, gasping and struggling to remove the residual water from my lungs and replace it with air. The transition back was far worse than entering the water. Nona, who quite evidently had done it several times before, recovered more quickly than I. As I lay panting and choking upon our couch, she made up a fire. The two stones which she rubbed together ignited in a moment—a slow, sulphurous-looking flame with a little smoke which the slight current of air through the cave carried away. Then, when the first stones were burning, she added other stones which glowed like coal.

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We ate our meal, and I lay again upon our couch with Nona sitting beside me. I was dozing, thinking over the experience I had undergone and planning how I could get more of this water food.

### THE FIRE

I was awakened by a sense of burning and smothering. I sat up, coughed, and twitched at Nona's hair to arouse her.

The cave was full of smoke. Beside me was what seemed a pit of fire. The heat from it was intolerable. I flung Nona into the air and followed her myself with a leap.

Across the cave we stood trembling with fright, regarding the red monster of fire that had eaten for itself an open pit in the cave-floor.

Nona had forgotten to extinguish the fire of our evening meal. These rocks were inflammable. The fire had eaten its way downward, as a fire on your Earth would eat downward into a bed of coal, spreading out beneath the ground.

Nona and I did not reason it out that way at the time. All we knew was that the red fire-monster had broken loose, and we were afraid of it. Blue and red tongues of flame licked up from the mouth of its lair; its hot, poisonous breath was stifling us even across the cave.

I was inactive only for a moment. Bidding Nona keep away, I tried to throw dirt into the little crater-mouth.

But the dirt had no effect. I might have extinguished it with water you say? True, I might, though I think now that the volatile, highly aerated water would have been of little avail.

I did not try the water. I did not know that water and fire were traditional enemies. Nor did Nona. How were we to know that, unless we had chanced to discover it for ourselves, which we had not.

Nona screamed at me and I gave up my futile efforts. The air in the cave was almost suffocating; and with the instinct that comes to any trapped animal underground, we scrambled up the passageway to the surface of the meteor.

It was night, with silver Saturn filling the overhead sky. Trembling, we stood and watched the cave-mouth from which a visible line of smoke was now issuing. Our home was down there; the fire-monster had it—and we could not go down and take it from him.

We never went back to the cave. The meteor's swift days and nights passed in rapid succession; and during several of them we stood helplessly watching.

Presently the fire came to the surface. I realize now that it was eating its way downward as well as upward until the entire vicinity of the cave was glowing with molten, burning rocks.

The ground all around the cave-mouth soon fell inward. A seething crater was exposed where the cave had been—a bottomless pit of lurid, licking flames with black smoke rolling up from it, and the hissing of steam below.

We took instant flight, swimming through the air over our tiny world, until, on its opposite hemisphere we found sanctuary.

There was no evidence of the fire here. We were pleased. We would find another cave, another river, and build our home anew.

We were both famished. I caught a lizard and we ate it—uncooked, for we were both afraid to unleash again the monster that had all but overcome us.

Then we slept; and again, when two of the meteor's brief days and nights were passed, and Saturn was sinking below the horizon to give place to dawning sunlight, we searched for a new cave.

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No cave was to be found. But there was water. A river several hundred yards wide bubbled up from the ground and flowed in a broad shallow stream toward the horizon. We followed it to a tiny line of hills. Into a hole in a cliff-face it plunged downward with an impetuous current.

THE NEW HOME

Here we decided to build our home. There were blue rushes along the river bank. Nona gathered them; she would dry them, plait them into robes for our couch.

Once I flew back to the fire. I could not get very close to it, for the air choked me. The fire seemed to be burning itself out. It was dull, with flickering puffs of flame in the midst of a thick pall of smoke which hung motionless in the still air.

I returned to Nona.

"The fire-monster is dying," I said. "But it has eaten our cave."

We were both pleased that it was dying.

I know now what was happening. The fire was being smothered for lack of fresh air to sustain its combustion. Had there been any wind I do not doubt but that the entire surface of the meteor would have been consumed.

An almost equally great danger threatened us, however—and presently we were made aware of it. The smothering, smouldering fire gave off steadily a tremendous volume of unconsumed gases. Even without any wind they diffused themselves throughout the meteor's atmosphere, it was so small a world, with so thin a blanket of air about it—an infinitesimal fraction of the air that envelopes your Earth. Rapidly it became polluted with poisonous gases from the half-smothered fire—polluted throughout its entire extent.

For a day we were uneasy. Then we grew frightened. There was little evidence of smoke—only a blue haze. But the air seemed to choke us. It was the poisonous breath of the fire-monster come to make us sick.

We tried to go somewhere to escape it. But we were on the opposite side of the world from it already, and no matter which direction we took, inevitably we approached it.

Except upward. We tried higher altitudes. The air was purer up there, but also it was thinner, and we could not live in it for any length of time. Nor could we sustain ourselves aloft indefinitely—to say nothing of sleeping and eating.

Once in desperation we tried swimming off the meteor into Space. But the lack of any breathable air at all soon brought us struggling downward.

That night there was a gentle wind. The breath of the fire-monster swept up over the horizon and came upon us with a deadly blast. We woke up, choking. It was daylight, with a small red-yellow sun dim and blurred by the poisonous haze that enveloped us.

Nona was crying. But suddenly I laughed, triumphantly, for I realized now that the fire-monster could not harm us.

We were lying at the river bank. I seized Nona in my arms and flung her headlong downward into the water. And I plunged in after her. The water here was deep—thirty feet perhaps, as you on Earth would measure it With arms flying, we sank like stones to the river bottom.

IV

I was presently breathing the water with fair normality. Indeed, after the noxious air we had been struggling with so long, it came almost as a relief. Nona's arms were about my neck; I loosed them, but she clung to my hand. Together we tried to stand upright.


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This river bottom seemed a gray sand. But we could not maintain footing. The water was empty—by which I mean there was no marine vegetation here—nothing that we could grip with our hands. And from behind us, the current wafted us gently but irresistably forward.

I soon discovered that normally we would float in an upright position. We held ourselves so with our toes occasionally touching the soil, bouncing along like feathers in a gentle breeze.

The scene around us now more resembled a misty gray day on one of your sandy Earth-deserts than anything else I can call to mind. The ground was undulating gray sand, sloping upward to one side, and with a steady incline downward in front. And down this slope we were blowing.

Swim, you say? It never occurred to either of us! We were frightened; we clung to each other, striving to remain upright.

Very soon the light from overhead seemed to deepen. But other light—the diffused light inherent to the water itself—grew brighter by contrast. We were swept forward much faster—and down a much steeper hill. I know now that the change was caused by the river having plunged into that cliff-face, to become subterranean.

How far we were carried I cannot say. A mile perhaps. Or more. Rocky cliffs now seemed to pen us in; it was as though we were in a steep canyon, with a powerful wind driving us down through it.

Then abruptly we came to the end of the canyon. Open country lay before us. There were hills in the distance, with the level floor of the sea between us and them. Long stalks of vegetation reared themselves up through the water—so high that I could not see to their tops—slender spires of growing things, rooted below, branching out above with huge air-bladders to keep them floating—the whole waving slowly to and fro. On some of them there seemed what you might term fruit.

### THE SUB-SEA HOME

It was a strange, but a beautiful and peaceful scene. This, then, was our new home—our new world! And how much better, more hospitable, it was than the one we had left! My heart swelled with pride as, standing beside my mate, I gazed at our new possessions.

A small living thing—slender and elongated and with a flat, waving tail—went past us waist-high. I clutched at it clumsily; but it eluded me and darted away.

On the ground beneath our feet were living things in shells. I seized one, ate it, and called to Nona.

Sounds? It was very still and quiet down here—but no more so than on the surface of the meteor above. The sound of my voice carried to Nona. Indeed, sounds here in the water carried very far, though somewhat muffled and blurred.

Having eaten of the shell-fish, the berries and the fruits, we lay down on the sand with Nona's hair floating above us. We were in the shelter of a tenuous clump of ferns which spread out like an arbor above us. I twisted my leg in them to hold us from possible drifting; and Nona clung to me.

We would rest and then build our home here.

## V

How long we slept I do not know. Nona brought me back to consciousness; she was twitching at my arm and whispering in my ear frantically.

"What?" I demanded; but she silenced me. She was pointing with a trembling hand. I saw what it was. Half a mile


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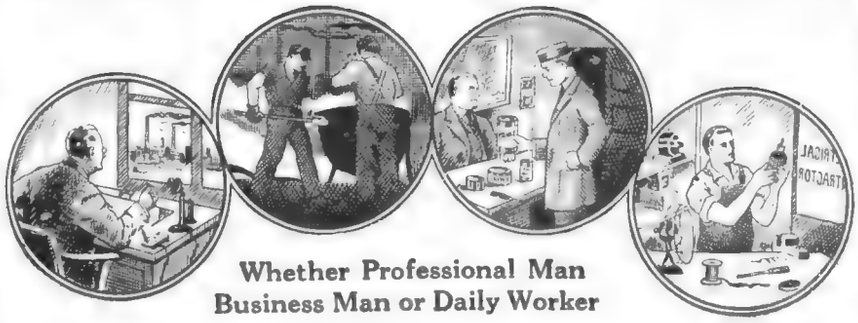

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away perhaps, over the sand hills, I could see figures moving. Living things were advancing toward us along the water-bottom!

I sat up, alert. Living things! I would capture and kill one for food.

But as they came steadily closer, I saw that each of them was nearly as large as ourselves—and there were ten or more of them. I trembled; and Nona and I drew back into the fern to hide.

The things continued to advance. Soon I saw that they were upright, coming along the sand as though walking, slowly but steadily. I thought they had not seen us. Nona and I lay very quiet, with our hearts pounding with fright. Soon the things were so close that I could examine them in detail. They were apparently human as ourselves—made after a general plan like our own.

I have since named them Marinoids—a name that may serve as well as any other. The males—or shall I call them men?—were some five feet in height. Their bodies were pink-white, smooth, with a glistening skin. They were clothed—crude greenish garments wrapped around them tightly. They had feet and jointed legs, which, however, were connected by a flapping membrane. Their chests were over-large. There were four arms, two at each shoulder. The arms waved in the water sinuously, like the tentacles of an octupus. At the ends of the arms were fingers—very long and slim—and a huge pincer, like that of a crab.

Yet for all that, these beings seemed in human form. The heads were hairy and round, with two eyes only slightly protruding, a nose, and a mouth not much different from my own save that it was larger.

The women were slightly shorter and more slender than the men, with long dark hair that floated habitually above them.

In this party which now approached us were ten individuals—four of them women. In spite of their size, there was about them—both women and men—a curious aspect of *unsolidity*. I felt less afraid of them as I realized it. They looked as though I could crush them in my arms. Their chests especially seemed no more than thin, inflated membranes, expanding and contracting with extraordinary rapidity.

I wondered, with a sudden flush of triumph, if these things would be good to eat. I whispered it to Nona.

"I can capture one," I said confidently.

"Wait!" she cautioned.

The Marinoids were still walking toward us along the sand—slow dragging footsteps combined with a sort of waddle for their legs were hampered by the membrane which connected them. Their arms were waving back and forth. The backs of most of them were bent, with their faces downward as though they were examining the sand.

I must have made some movement. They saw us! They stopped, and seemed to grow suddenly alert. The men consulted together, pointing at us; the women drew partially behind them as though for protection.

I struggled upright, in spite of Nona's warning and her restraining hold. I would fight these things—kill them for our food. It would be a glorious feast; my Nona was hungry.

### THE FIGHT

I plunged forward. The Marinoids were alarmed—startled, would described their aspect better. The men stood their ground; the women darted upward through the water, swimming on one side with legs waving the connecting membrane like a great fish's tail.

One of the Marinoid men had shouted something. I could hear his voice plainly—words seemingly—a rasping order. Nona was behind me, following me closely, ready to help me fight.


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"Quick!" I shouted. "Catch one, Nona!"

It was so futile! The Marinoid men left the sand and darted at us so quickly that we could not have eluded them had we tried. They were upon us in an instant: I was helpless as they threw me down and with surprising strength in those three-foot long tentacles, wrapped them around me and held me.

Three of the men were thus engaged with me; and two were holding Nona. But they did not attempt to hurt us; indeed, they seemed to avoid doing so.

The sixth Marinoid—he who had shouted the order—was hastily gathering long, rope-like segments of the vegetation. At his command, Nona and I were raised upright. The women came down to the sand and they all inspected us curiously, talking among themselves with words to us unintelligible, but gestures which seemed wholly rational.

At last they bound our arms tightly against our sides and started us walking along the sand. They were leading us away, out over the sandy open spaces toward a line of hills in the distance.

The women swam above us; the men walked in a group, pushing Nona and me in front. We could run faster than they, and once we broke away. But they swam after us and caught us in an instant. And one of them warned us with a gesture which was unmistakable.

Soon I saw what this party had been doing before they encountered us. We passed occasionally, huge receptacles made seemingly of woven sea-vegetation. Into these baskets they had gathered various living, shell-backed creatures of the water-bottom. And these baskets in turn would be gathered up and carted away by other Marinoids.

I learned this later; Nona and I understood none of it at the time.

As we advanced, the aspect of things around us changed continually. The vegetation grew thicker, until soon we were in a veritable forest of it. And we seemed to be following a road—a pathway which had been cleared.

Abruptly I heard a shout ahead. The Marinoid women swimming above us came suddenly d.. vn. Our leader said something, and they all drew back from the road, pulling us with them.

The shout ahead of us grew louder. A moving object came into view—a sort of sleigh made of a huge shell. It was gliding over the sandy road toward us, pulled by a strange swimming animal.

In the sleigh were two Marinoid men—the larger of them elaborately clothed. The sleigh halted abreast of us. The smaller of its occupants stood up and shouted vehemently. And suddenly I realized that he was shouting at me! My captors were lying prone on the sand, and had pulled Nona down with them. But in their excitement and awe—for this was the ruler of their world—they had left me standing alone.

I stared stupidly at the angry figure in the sleigh; and suddenly, in his wrath at the effrontery of my upright posture before his Monarch, he launched something at me. I saw it leave his hand. It was long, thin and pointed. It came through the water like a spear thrown through air. It hit my head a glancing blow.

I sank down to the sand. I heard shouts around me—Nona was screaming. Then my senses faded into blackness.

## VI

You have read my tale of the Marinoids—a brief glimpse, and only a glimpse, for I am an old man and my memory is full of strange lapses.

One of your Earth-poets has said: "There are more things in Heaven and Earth than

# Priceless Service

Despite fire or storm or flood, a telephone operator sticks to her switchboard. A lineman risks life and limb that his wires may continue to vibrate with messages of business or social life. Other telephone employees forego comfort and even sacrifice health that the job may not be slighted.

True, the opportunity for these extremes of service has come to comparatively few; but they indicate the devotion to duty that prevails among the quarter-million telephone workers.

The mass of people called the public has come to take this type of service for granted and use the telephone in its daily business and in emergencies, seldom realizing what it receives in human devotion to duty, and what vast resources are drawn upon to restore service.

It is right that the public should receive this type of telephone service, that it should expect the employment of every practical improvement in the art, and should insist upon progress that keeps ahead of demand. Telephone users realize that dollars can never measure the value of many of their telephone calls. The public wants the service and, if it stops to think, cheerfully pays the moderate cost.

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are dreamed of in your philosophy." How very true that is! You who breathe air and live on land—on one and only one tiny little Earth among all the billions upon billions of worlds that throng our Universe—how little you dream of the existence of other beings.

I tell you only simple facts, within the failing memory of my own human lifetime. I do not expect you to credit me—your life has been too narrow, your experience limited to one infinitesimal rut in the Creator's vast plan. And though I cannot altogether blame you, since you are thus limited, it makes me smile to realize how fatuous you are with your self-importance. "I have not seen this—I cannot understand it—so it cannot be!"

Only one point in my narrative I wish you to grasp and ponder over. I assume you agree that although Nona and I at the time were merely at the beginning of our mental life, we had latent within us an intelligence the equal of your own. Let us say, we were broadly representative of you. Yet Nona and I were not the intelligent, superior human beings, captured by some strange marine animals—as a man in your waters might be set upon by sharks. Quite the reverse. It was we who were the inferior humans; to those Marinoids we were unknown, savage things who had invaded their world.

That is not theory; it is fact. And so, if by the recital of this narrative, I have even made you stop and think that perhaps you and your kind are not all-important in the Creator's plan—my purpose will have been accomplished.

(*To be continued*)

## Can We Visit the Planets?

BY DON HOME

(*Continued from page 962*)

Even if such an ideal machine might be made, the possibility ever of spanning the twenty trillion miles to the nearest star is negligible when we consider the time required to get there. Granting that man can withstand a reasonable pressure, and allowing time for starting and stopping the projectile, it is just possible that the trip might be made in less than a life time.

The philosophical results of the theory of relativity lead to an interesting speculation. According to Einstein, no object can attain a velocity greater than that of light and it would be possible for our projectile to approach that speed in about ten years. It happens, however, that the greater his speed the slower his clocks move; in other words, the nearer he reaches the speed of light, the less is his sense of the time passing. The secret of eternal youth, therefore, is to rush on at the terrific speed of 186,000 miles a second. A man might visit the edge of space after only a few years of his time, but centuries of our own, had elapsed.

In the Einstein theory, time and space are inseparable. We ordinarily admit that a person can be two times at the same place, but it seems a paradox that one could be two places at the same time. Nevertheless, this is possible. In order to accomplish this, a person should leave the spot with the speed of light, at which velocity all organic processes would cease and, as he would be conscious of no advance in time, it would seem merely the next instant when he arrives in a part of space far removed from his starting point.

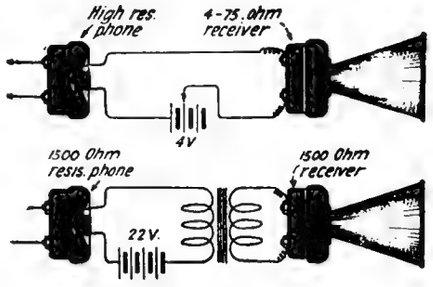
But what may we expect to gain from interplanetary visits? Surely we are not the only living beings throughout infinity! Such egotism is inexcusable.

## How to Hook-Up A Transmitter Button to Make an Efficient Loud Talker

A Transmitter button with a few dry cells and a telephone receiver will make a remarkably simple and efficient loud talker. A Microphonic amplifier of this type is just the thing for use with a radio set. The weak music and signals may be amplified many times their original value. It is possible to entertain a large audience with a simple radio equipment if a transmitter button is used in the circuit as explained in diagram A.

The cost is extremely low and the results are comparable with those produced by highest grade of expensive loud talkers.

As may be seen in the diagram, two dry cells or a small storage battery are connected in series with the transmitter button and a 4 to 75 ohm telephone receiver. The transmitter button is secured to the diaphragm of the telephone in the radio receiving set. To accomplish this properly, scrape off the enamel (if diaphragm is enameled) on the face of the diaphragm and solder the small hexagon nut supplied with the button to the exact center. Care should be taken that the thin diaphragm is not bent or otherwise




harmed. The transmitter button is then screwed into place. Connections, as shown in the diagram, are made with flexible wire. A horn may be placed over the low resistance receiver if desired. When the radio set is properly tuned and signals are being received, the transmitter button is operated by the vibration of the diaphragm of the receiver. As the receiver diaphragm vibrates, the mica diaphragm on the transmitter button also vibrates. The carbon grains are compressed at varying pressure; the current flowing through the local battery circuit is thus varied and results in an amplification of the sounds in the low resistance telephone loud-talker.

Diagram B, which includes a step-up transformer, is to be used with loud talking receivers of high resistance. The primary of the transformers should have a resistance of about 75 ohms. An ordinary telephone induction coil will serve as the transformer in this circuit.

You can get the above-described transmitter button FREE in subscribing to "Practical Electrics Magazine" at $2.00 per year (12 months). Send your subscriptions today.

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—Adv.

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Other life than ours in the solar system seems improbable. It is thought that our four outer planets, Jupiter, Saturn, Uranus and Neptune are very cold—a hundred degrees below zero, Centigrade—perhaps almost entirely composed of ice particles, and surrounded by heavy impenetrable clouds. Mars, though blessed with water and a very thin atmosphere, is also very cold, seldom rising above the freezing point. Venus possesses a heavy atmosphere which appears, however, to contain no oxygen or water vapor. It is probably a desert, scorched by burning winds which so fill the air with dust that our telescopes can never penetrate to the solid layer. Under the blazing sun, the airless bodies, Mercury and the Moon, reach temperatures above boiling water, and during the night rapidly lose any stored up heat from the day time. Evidently there is small chance for life, *as we know it,* to exist on any of our sister planets.

"But," you say, "Is it not possible that life may take other forms that we know nothing of?" We answer, "Your imagination is as good as ours."

Nevertheless, we prefer to adopt the scientific viewpoint, that life has adapted itself to the requirements of our earth, rather than that we are here merely because the earth is suited to our needs. It will be decades, perhaps centuries, before these problems will be solved. And let us be thankful that science cannot be hurried. Any working out of any part of the problem would bring the affair to a climax and the world is not ready for such a step. Be not too hasty for a glimpse behind the veil! As yet no one has solved the mystery of life, but when the other projects have been accomplished, this, too, will cease to be a problem. And pray that the world may be prepared for such a revelation!

## Answers to Scientific Puzzles

(*Continued from page* 991)

### 1—THE PUZZLE PICTURE

THE following mistakes are represented in the picture:

1. The dipper is shown in the east instead of the north.
2. In the handle of the dipper is shown four stars. In the real dipper there are only three.
3. When the dipper is right side up the handle appears to the left instead of on the right as shown in the picture.
4. The Milky Way never appears in the constellation of the dipper.
5. A crescent moon near the horizon is visible only when the moon is setting. Hence such a moon could not be seen at midnight.
6. The shadows in the picture are toward the moon instead of away from it.
7. A star cannot be seen between the tips of the moon, for a star in such a position would be eclipsed by the moon.
8. The directions on the weather vane are contradictory.
9. The curvature of the crescent cannot be convex upward at night because the curvature must be toward the sun which at night is below the horizon.
10. The pennant and the sail of the boat are indicating that the wind is blowing two ways at once.

### 2—GETTING THE AUTO OUT

The block and tackle should be reversed so the man will be pulling in the direction in which he wishes the auto to move. At present if he can exert a pull of a hundred pounds on the rope a force of 400 pounds will be applied to the car. But if he turns the block and tackle around a pull of 100

# "I Was At The End of My Rope"

"WE LIVED in a fairly comfortable home, but it was a terrific struggle to make both ends meet. I couldn't save a cent and I was deeper in debt than I dared confess to my wife.

"I hadn't had a decent raise in years, and there were nights—too many of them now—when I lay awake for hours wondering what we would do if I ever lost my position.

"Other men were getting ahead of me and I knew that I couldn't stand still. I had either to go up or down. And I was afraid it was going to be down!

"Then suddenly one night it came to me like a flash that the reason I wasn't getting anywhere was mainly because I had never made any definite effort to make myself more valuable to the firm.

"I knew my own little routine job, but that was all. I was just one of the force to my employers. There was really no reason why they should think of me when a better position was open.

"That night I made my decision. 'If the I. C. S. can raise the salaries of other men,' I said to myself, 'it can raise mine. If it can help other men to win promotion and have happier, more prosperous homes, it can help me, too. To-night, right now, I'm going to send in that coupon and find out what the I. C. S. can do for me.'

"It was the best move I ever made. My employers heard about my studying and started to take an interest in me. Six months after I enrolled with the I. C. S. I received my first increase in salary. Within two years I was head of my department. And I'm going still higher."

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pounds on the rope will yield him a force of 500 pounds on the car.

### 3—THE PAINTER'S SCAFFOLD

When the free end of the rope is attached to the scaffold the cornice supports only the weight of the scaffold and whatever is on it, but when the rope is connected to a peg in the wall the cornice has to support in addition the tension in this rope—a force which in this case would be equal to one-fourth the weight of the scaffold and its load.

### 4—THE MERCHANT'S STEELYARD

The merchant was practically never cheated by his own steelyard. In practice he handed the balance to the customer and let him do his own weighing. If the man were buying from the merchant, the buyer's own cupidity would lead him to adjust the weight so that the arm of the balance would slant upward from the pan. This would let the mercury run toward the pan end of the balance and hence give him short weight for his money. On the other hand, if the man were selling to the merchant the seller would unwittingly adjust the movable weight as far toward the end of the arm as he dared, make this end tip down enough to let it fill with mercury and so in the final adjustment leave the mercury counterbalancing a portion of his goods for which he would receive no pay.

### 5—THE BALL RACE

A hollow ball will roll down hill more slowly than a solid one because the mass of the hollow ball is concentrated to a considerable degree near the periphery where its inertia or tendency to resist change of motion is most effective.

### 6—PREVENTING THE FREEZING OF VEGETABLES

Placing tubs or pails of water in a basement often prevents fruit and vegetables from freezing because of the heat given out by the ice when it freezes. Thus each gram of ice on freezing gives out as much as 80 calories of heat, or enough to retard the fall of temperature of the basement until the danger of freezing is over. As most fruits can stand a temperature as low as that of freezing ice but cannot stand a much colder temperature this method for preventing them freezing is quite successful.

### 7—THE APPARENT SIZE OF THE MOON

The enlarged appearance of the moon when it is near the horizon cannot be attributed to anything but an optical illusion, probably produced by its contrast with buildings and trees which can, at that time, be seen in the same field of vision. The effect disappears when one looks at the moon through a tube that prevents sight of other objects. If the angle of the moon is measured with a sextant it will be found to be always the same.

### 8—THE DRAFT IN THE CHIMNEY

Most materials of which a chimney is built absorb heat more readily than air. Hence if the sun is shining or has been shining upon an empty chimney the air within the chimney is naturally a little warmer, and therefore lighter than the air surrounding it. The draft is then produced in the usual manner, the lighter and warmer air being forced upward by the pressure of the colder and heavier air entering at the bottom.

### 9—SOME CLOTHES DRY FASTER THAN OTHERS

Dark objects absorb heat readily; white objects reflect it. Hence water evaporates more rapidly from dark or colored clothes than it does from white goods because the white clothes do not so readily receive the heat that reaches them, much of it being reflected.

### 10—PRESSURE AGAINST A DAM

The force of water against a dam is independent of the length of the body of

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water behind it. The total side push of the water depends only upon the depth and density of the water and upon the area of the dam itself.

**11—WHY A BALLOON ASCENDS**

A balloon ascends because it is lighter than the air it displaces and not because of any peculiar buoyant force of the gas within the balloon. In fact, if a balloon could be made strong enough to withstand the pressure of the air and yet light enough to make it weigh less than the air which it displaces an empty balloon would be better than one filled with any kind of gas.

**12—THE "FORCE OF SUCTION"**

Contrary to common opinion, soda water does not rise in a tube because of any "force of suction" pulling the liquid upward. In sucking a liquid through a tube merely the air pressure is reduced within the tube, and the greater pressure of the atmosphere on the surface of the liquid in the bottle or glass forces the liquid upward.

---

## DR. HACKENSAW'S SECRETS

**By Clement Fezandié**

(*Continued from page* 979)

Doctor Hackensaw's face grew troubled, but after carefully examining the arm, his countenance cleared.

"It's all right, Mrs. Young," said he. "The microbes I injected are multiplying fast, but there are not yet enough of them to do much good work. You really are a week older than when you came here last. But the bacilli I injected will keep on increasing at a geometrical ratio, and you will soon begin to feel their effects."

"I hope so. But, doctor, what would the insurance and other companies do if people could buy life-annuities or pensions and then go on living forever?"

Doctor Hackensaw laughed. "I guess the companies would find means of stopping the payments after a hundred years or so," he observed.

**OPERATION SUCCESSFUL**

The doctor was correct. A month later, the old lady was perceptibly better, and after three months she could hold herself erect and walked into the office with a firm tread.

"Doctor," said she, with a laugh. "The charm is working—I feel ever so much younger."

Doctor Hackensaw carefully felt her pulse and listened to her breathing.

"Madam," said he, "allow me to congratulate you. You are really ten years younger than you were when I performed the operation."

"Indeed! That makes me seventy-five. When I get back to forty I shall marry John Trimble. Meanwhile, here is part of the fee I promised you, and the remainder you'll have on my wedding-day!"

A couple of months passed, when one day a lady, apparently about forty years old and remarkably pretty for her age, was ushered into the doctor's sanctum.

"You wish to see me, madam?" asked that worthy.

The lady laughed, a rich, warm laugh.

"You do not recognize me, then? I am Mrs. Linda Young. Have I changed so much?"

Doctor Hackensaw gazed at her in astonishment.

"You? Mrs. Young?" he exclaimed, gazing at the luxuriant black hair that had replaced her white locks, and noting her firm,


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Are you strong, healthy, vigorous, filled with pep and vitality? Or are you weak, thin, nervous—an apology for a *real* man—afflicted with Constipation, Indigestion, Vital Depletion, or other ills caused by bodily neglect and abuse?

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Send ten cents to cover postage.

LIONEL STRONGFORT
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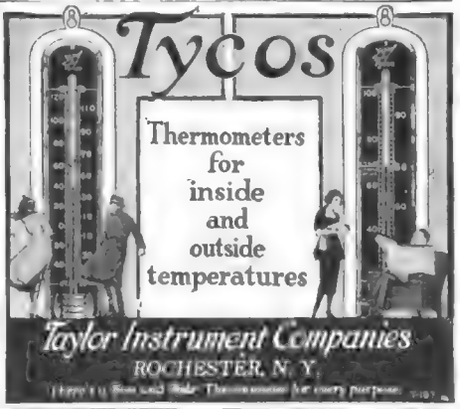


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"What a whale of a difference just a few cents make"

*All the difference* between just an ordinary cigarette and the most skillful blend in cigarette history.

FATIMA

—*a mild cigarette*

SUPER VALUES

OUR POLICY 20% OFF LIST PRICES ON ALL STANDARD RADIO APPARATUS

SPECIAL NEW N. & K. MODEL D 4000 OHMS Manufactured by Neufeldt & Kuhnke, Kiel, Germany $6.50

Reinartz Circuit Complete

| | List Price | OUR Price |
|---|---|---|
| Genuine Reinartz Coil endorsed by John L. Reinartz and bearing his signature. The only genuine coil for this circuit on the market. All others are imitations | $ 2.50 | $ 2.00 |
| One 7x10x3-16 Radion Panel | 1.25 | 1.00 |
| National Bakelite Socket | 1.00 | .40 |
| Vernier Rheostat | 1.50 | 1.00 |
| Two 23 Plate Variable Condensers at $3.00 each | 6.00 | 3.00 |
| Switch Points and Nuts | .80 | .40 |
| Six Switch Stop Points and Nuts | .40 | .20 |
| Freshman Grid Leak and Condenser | 1.00 | .65 |
| Seven Binding Posts | .70 | .35 |
| 25 Ft. Tinned Bus Bar | .50 | .30 |
| 3 Switch Levers with Knobs | .75 | .35 |
| One Baseboard for mounting | .75 | .40 |
| One Fixed Phone Condenser | .40 | .25 |
| One Single Jack | 1.00 | .25 |
| Blue Prints with complete instructions for assembly and mounting | .50 | .50 |
| Regular Price | $19.05 | |

OUR PRICE $11.05

All the necessary screws, nuts and miscellaneous small parts which are necessary to complete the set are included in the above prices. Any part in either of these circuits may be purchased independently at the advertised cut prices.

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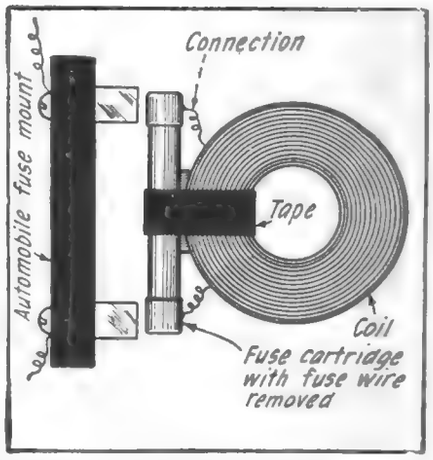
# RADIO WRINKLES

EDITED BY
A. P. PECK,
Associate Member Institute Radio Engrs.

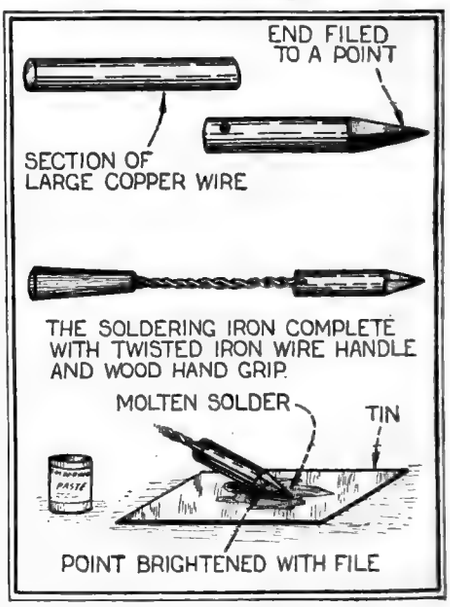
UNDER this heading we are going to publish items of interest to everyone who likes to build radio instruments. In order to continue this department it is necessary for our readers to tell us about their latest experiments. Write us a short description of some time- or money-saving kink you have discovered and send it to us along with a few sketches. Our regular prizes will be paid for this material. Be brief and try to put everything in the drawing. Don't be too elaborate. Address "RADIO WRINKLES" editor, care of Science and Invention.

## Honeycomb Coil Mounting




An old fuse block is always a potential mounting for a honeycomb coil and the finished instrument made therefrom is illustrated above. The fuse wire is removed from the cartridge and the metal caps replaced. The coil is then fastened to the cartridge by means of tape. The two leads from the coil are then soldered to the brass caps and two clips may be mounted directly on the panel. This provides means whereby coils may be changed at will and also provides a movable mounting. When necessary, the polarity of the coils may easily be reversed; a thing that cannot readily be done with the standard mounting. —Robert Mackenzie.

## Small Soldering Iron


END FILED TO A POINT
SECTION OF LARGE COPPER WIRE
THE SOLDERING IRON COMPLETE WITH TWISTED IRON WIRE HANDLE AND WOOD HAND GRIP.
MOLTEN SOLDER
TIN
PASTE
POINT BRIGHTENED WITH FILE

A small soldering iron is very useful in radio work and can often be used in small spaces where a large iron will not work. The iron may be made from a section of No. 1 or No. 0 copper wire as illustrated above. The point is then tinned as shown in the lower part of the above illustration. This iron will hold its heat for a fairly long time and can readily be brought to a working heat in a small alcohol flame. —Evermont Fisel.

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# BUILD YOUR SET BETTER–AT LOWER COST

## SUPERIOR 180° VARIOCOUPLER

N521 Each .....98c

A wonderful value, produces excellent results. Green silk windings on black fibre tubes. Rigid mounting support for table or panel mounting. Primary tapped for fine tuning. ¼ inch shaft. Range 200 to 600 meters.

N522 Variometer—same style. Each...98c

## SUPERIOR VARIOCOUPLER

N523 Each.....$3.15

A handsome instrument of superior design and construction. Stator tube and rotor ball of moulded red brown bakelite. Large size green silk windings insure highest efficiency. Table or panel mounting. ¼ inch shaft. Superior results in circuits for 180 to 650 meters. Tapped primary for finest tuning. Noiseless contacts.

N528 Special single circuit type....$3.60

## SUPER MOULDED VARIOMETER

N412 Each.....$2.60

Polished black moulded rotor and stator forms. Maximum inductance with greatest efficiency and minimum distributed capacity. A high grade instrument that will get the best results. Wave length 180 to 600 meters.

## EXCEL MOULDED VARIOMETER

N524 Each.....$4.45

A wonderful value at our price. Properly designed and constructed. Polished black bakelite rotor and stator forms. Large size green silk wire insures greatest efficiency. ¼ inch shaft. Noiseless pigtail connection. Table or panel mounting. Split stator winding with binding post connections.

## SUPERIOR VARIOMETER

N525 Each.....$3.68

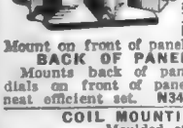
Forms moulded of red brown bakelite. A neat handsome instrument. Green silk windings calculated for highest efficiency. ¼ inch shaft. Noiseless pigtail connections. Table or panel mounting. Produces superior results in any type circuit 180 to 650 meters.

## RADIO INDUCTANCE COILS

Carefully made—fine looking coils. Highest efficiency. Low distributed capacity effect, low resistance—high self inductance. Very firm impregnation. Range given is in meters when used with .001 variable condenser. Mounted coils have standard plug mountings.

| Turns | Range | Art No. | Not Mntd. | Art No. | Price Mntd. |
|---|---|---|---|---|---|
| 25 | 120- 250 | N301 | $0.32 | N329 | $0.75 |
| 35 | 175- 450 | N302 | .37 | N322 | .90 |
| 50 | 250- 720 | N303 | .43 | N323 | .96 |
| 75 | 390- 910 | N304 | .48 | N324 | 1.02 |
| 100 | 500- 1450 | N305 | .52 | N325 | 1.07 |
| 150 | 600- 2000 | N306 | .57 | N326 | 1.11 |
| 200 | 900- 2500 | N307 | .66 | N327 | 1.20 |
| 250 | 1200- 3500 | N308 | .72 | N328 | 1.29 |
| 300 | 1500- 4500 | N309 | .76 | N329 | 1.30 |
| 400 | 2000- 5000 | N310 | .91 | N330 | 1.51 |
| 500 | 2800- 6100 | N311 | 1.06 | N331 | 1.57 |
| 600 | 4000-10000 | N312 | 1.20 | N332 | 1.72 |
| 750 | 5000-12000 | N313 | 1.36 | N333 | 1.87 |
| 1000 | 7900-15000 | N314 | 1.64 | N334 | 2.18 |
| 1250 | 9750-19500 | N315 | 1.86 | N335 | 2.35 |
| 1500 | 14500-26500 | N316 | 2.10 | N336 | 2.50 |

## INDUCTANCE COIL MOUNTINGS



N340—3 Coil. Each .....$3.35

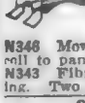
N341—2 Coil. Each ..... 2.67

Sturdy, rigid durable construction. Made of polished black bakelite. Mount on front of panel.

## BACK OF PANEL MOUNTING

Mounts back of panel, with knobs or dials on front of panel. Helps make a neat efficient set. N342—Each.....$4.45

## COIL MOUNTING PLUGS



Moulded of genuine bakelite.

N344 Plug for mounting "honeycomb" inductance coils .....38c

N345 Stationary plug to fasten mounted coil stationary to panel .....42c

N346 Movable plug to fasten mounted coil to panel so it can be rotated.....89c

N343 Fibre strip to hold coils for mounting. Two foot piece.....15c

## SPIDER WEB COILS

N290— 25 turn 39c N292—50 turn 47c
N291— 35 turn 42c N293—75 turn 54c
N294—100 turn. Each.....68c

A new popular type of inductance of highest efficiency. Lowest distributed capacity and lowest high frequency resistance. Firm green silk windings with fibre mounting strips.

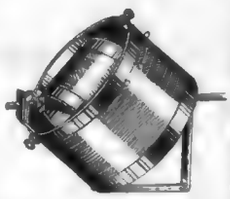
## YOU SAVE MONEY WHEN YOU BUY FROM US

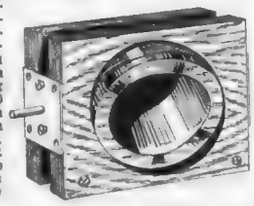
**We Pay Transportation Charges East of the Rockies**

THE PRICES QUOTED DELIVER THE GOODS TO YOUR DOOR
FAST SERVICE — TRY US AND BE CONVINCED

**THIS GUARANTEE PROTECTS YOU—Examine the goods we ship you. They must suit you in every respect. If you are not satisfied with your purchase return the goods at once and we will refund the price you paid.**

## OUR SPECIAL VARIOMETER AND VARIOCOUPLER





Build into your set reliable instruments. You can depend on this variometer and variocoupler to give you the best results in any circuit working from 180 to 650 meters. In design and construction they are the best. Only the highest grade materials are used. The prices quoted save you 30 to 40 per cent. Why pay more?

N418 Variocoupler. Each .....$2.45
The most efficient type of coupler, insures better tuning and louder signals. Primary and secondary wound on natural uncolored genuine bakelite tubes. Handsome green silk windings. Primary tapped for fine tuning. Can be panel or table mounted. 3-16 inch shaft

N410 Variometer. Each.....$2.10
Perfect in design and construction. Accurate wood forms thoroughly seasoned. Correct inductive ratios. Solid baked windings. Plenty of large sized wire insures highest efficiency. A strong high grade instrument that will give you lasting service. 3-16 inch shaft.

## SOLID BARE COPPER WIRE

Solid bare copper wire for aerials, leads or wiring instruments.

Solid Bare Copper Wire, size 14.
N240 100 ft. coil 48c N242 500 ft. coil $2.25

Solid Bare Copper Wire, Size 12.
N244 100 ft. coil 67c N245 500 ft. coil $3.05

## STRANDED ANTENNA WIRE

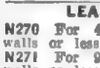
Cabled of fine copper strands. Very flexible. High tensile strength. Best for aerials.
N248 100 ft. coil 58c N249 500 ft. coil $2.75

## MAGNET WIRE

Insulated copper wire. Best quality even drawn wire, one piece to a spool. Prices quoted are for 8 oz. spools unless otherwise stated. Note, our prices are prepaid.

| DoubleCotton Covered | | Enameled Insulation | | Green Silk Covered | |
|---|---|---|---|---|---|
| Number N990 | | Number N992 | | Number N991 | |
| Gauge | Price | Gauge | Price | Gauge | Price |
| 18 | .39c | 20 | .35c | 20 | $0.75 |
| 20 | .48c | 22 | .45c | 22 | .90 |
| 22 | .60c | 24 | .50c | 24 | 1.05 |
| 24 | .65c | 26 | .55c | 26 | 1.15 |
| 26 | .80c | 30 | .60c | 30 (4 oz.) | .90 |
| 28 | .95c | 32 | .65c | 32 (4 oz.) | 1.00 |
| 30 | $1.15 | 36 | .85c | 36 (4 oz.) | 1.30 |

## ANTENNA INSULATORS



N260

N260 Size 1x3¼. Composition, metal eyelets. Two for .....17c

N263 Ribbed Porcelain insulator, 2½ in. long. Ea. 6c Dozen .....55c

N265 Ribbed porcelain insulator—5 inches long. Each.....15c

## LEAD-IN INSULATORS

N270 For 4 inch walls or less.....42c

N271 For 9 inch walls or less.....69c

The only practical lead-in insulator for aerial wires. Small, neat, effective, durable. Fits ⅝ inch hole. Securely locked by two adjustable nuts.

## OUTDOOR LIGHTNING ARRESTER

N980 Price.....$1.55

Protect your instruments with this lightning arrester. Weatherproof porcelain case. Air gap type. Permanent. Durable. Underwriters approved.

## JEWELL LIGHTNING ARRESTER

N981 Each.....85c

A dependable protector, always on guard. Small and compact. Weatherproof porcelain case. Easily fastened and connected. Underwriters approved. Lists for $1.10.

## TINNED COPPER "BUS BAR" WIRE

Size 14 tinned copper wire. For wiring sets. Best size for neat job and easy soldering.

N957 Round. Ten feet for.....12c
N958 Square. Ten feet for.....14c

## SPAGHETTI

For covering connecting wires in sets. For size 12 and 14 wires.

N955 Finest quality braided and saturated with best baked lustrous transparent insulating varnish, 3 feet for.....9c

N956 Best quality braid and covered with black insulating compound. 3 feet for..9c

## PORCELAIN BASE SWITCHES

Fine white porcelain bases. Copper contacts and blades. Can be used as antenna switches.

N385 Single Pole Single Throw. Each 20c
N383 Single Pole Double Throw. Each 32c
N384 Double Pole Double Throw. Each 50c

## BRASS ROD

Supplied only in 8 inch lengths.

N961 Threaded 6-32, per 8 in. length..6c
N963 Threaded 8-32, per 8 in. length..8c
N965 Solid 3-16 in., per 8 in. length..6c
N967 Solid ¼ in., per 8 in. length....9c

## COPPER FOIL

N968 Per piece .....25c

Thin copper foil for shielding panels. 6 inches wide. 2 feet long. .005 inch thick.

## RADIO SOLDERING IRON

N540...$1.50

Soldered connections in radio sets produce better results. This guaranteed iron is exactly right for radio work. A neat solid connection quickly and easily made. Operates on any lighting current 100 to 120 volts. 6 ft. cord with attaching plug. Length 13 inches. Heats quickly will not overheat.

Heavier irons for general repair work. Wonderful values at our prices.

N541 Medium size .....$3.48
N542 Large size ..... 4.25

## ENCLOSED VARIABLE CONDENSERS

One of the best made condensers. Rigid, accurately spaced aluminum plates. Formica ends. Engraved scale. Knob and pointer. Clear transparent case.

N806 43 plate .001 Mfd. .....$2.80

N808 21 plate .0005 Mfd. .....$2.45

## PANEL MOUNTING VARIABLE CONDENSERS

These are especially high grade condensers and we guarantee them to be mechanically and electrically perfect. Fine polished end plates of heavy bakelite. Shafts ¼ inch diameter. Sturdy, heavy aluminum alloy plates perfectly spaced to insure smooth, even, reliable capacity. Our low prices save you money. These condensers are of the very best make and are not to be compared with many inferior, cheap condensers offered. We guarantee them to please you or your money back. The vernier style has one separately controlled plate which permits of the finest tuning. Quality considered, these values are unapproached by others.

### REGULAR STYLE

N815— 3 plate .....58c
N816— 5 plate .....97c
N814—11 plate .00025 mfd.....$1.13
N813—31 plate .0005 mfd..... 1.27
N812—43 plate .001 mfd..... 1.47

### VERNIER STYLE

Including Dial and Knobs

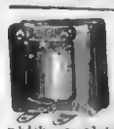
N825—14 plate .00025 mfd.....$2.45
N824—26 plate .0005 mfd..... 2.70
N826—46 plate .001 mfd..... 2.95

## OUR SPECIAL AUDIO FREQUENCY AMPLIFYING TRANSFORMERS

N550 Each.....$2.25

In quality of tone and volume of sound, the things a transformer is built for we guarantee it to equal or surpass any other transformer. Neat in appearance. Carefully made. Fully mounted with plainly marked binding post connections. Wonderful results on one, two or three steps without distortion or howling. A quality item in every respect.

## NATIONAL SHIELDED TRANSFORMER



N551 3½ to 1 Ratio $2.48
N552 6 to 1 Ratio... 2.68

Note that our price is prepaid. The same high grade style of transformer as above enclosed in a metal case which completely shields it from any outside magnetic influences. Free from howling and local disturbances.

## OTHER STANDARD BRANDS AUDIO FREQUENCY TRANSFORMERS

Fresh, clean stock in original containers.

N232 THORDARSON Ratio 3½ to 1 $3.30
N233 THORDARSON Ratio 6 to 1... 3.70
N553 Acme. Each..... 4.20
N554 Coto. Each ..... 4.45
N555 Federal. Each ..... 4.45
N712 Radio Corp. Each ..... 5.70
N234 All American 10 to 1 Shielded 3.80
N239 All American 5 to 1 Shielded 3.80
N236 All American 3 to 1 Shielded 3.60

## TRICOIL RADIO FREQUENCY AMPLIFYING TRANSFORMER

N560 For 201A or 301A Tubes .....$1.58

N561 For 199 or 11 or 12 Tubes ..... 1.58

This transformer will produce wonderful results in any type of regular or reflex radio frequency circuit. Perfect for one, two or three stages. Compact, convenient form, easily mounted. Range 175 to 600 meters.

## OTHER STANDARD BRANDS RADIO FREQUENCY TRANSFORMERS

N568 Our special—as good as any of them .....$ .48
N502 Dubilier. Each ..... 4.45
N563 Coto. Each ..... 4.45
N565 Acme. First stage. Each..... 4.45
N566 Acme. Second stage. Each..... 4.45
N567 Acme. Third stage. Each..... 4.45
N714 Radio Corp. Each..... 5.95
N995 All American. Each..... 3.95
N575 Erla. First stage. Each..... 3.45
N576 Erla. Second stage. Each..... 3.45
N577 Erla. Third stage. Each..... 3.45
N578 Erla. Reflex No. 1, 2 or 3. Each 4.35

## LONG NOSE PLIERS

N970 Price..95c

The handiest pliers for radio work. Made of fine hardened steel. Length, 5 in.

## DIAGONAL JAW NIPPERS

N972 Price.....95c

For fine electrical work, made of hardened steel. Length, 5 inches.

## FOUR-IN-ONE Screw-Driver

N974 Each .....55c

Especially suitable for radio work. Will handle any size screw used. Smaller drivers nest inside larger one and are held in place with screw cap. Made of steel, nickel finished.

## TINOL

N969 Per tube ..19c

A combined solder and flux in handy form. Put a little on the connection, heat with a match, torch or solder iron and you have a neat electrically and mechanically perfect joint.

## AUTOMATIC BLOW TORCH

N543 Each.....$1.19

Burns denatured alcohol. Automatically generates pointed flame in a few seconds. Easy to solder joints in hard places. Lights with a match. Burns 20 minutes on one filling. 5½ inches high, ⅞ inch diameter cylinders. Works fine with Tinol listed above.

## SUPER BLOW TORCH

N544 Each.....39c

Burns denatured alcohol. Vest pocket size. Blowing on tube produces a hot pointed flame. Lights with a match. Works fast. Burns 10 minutes on one filling. Easy to solder joints in hard places. 3 in. high. ⅞ in. cylinder. Long rubber tube. Produces fine joints with Tinol listed above.

**THE BARAWIK CO.** Chicago's Original Radio Supply House Beware of Imitators **102 South Canal St., Chicago, Ill.**

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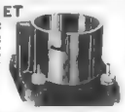
# WITH BARAWIK QUALITY RADIO GOODS

### VACUUM TUBES

Standard Brands—Cunningham, Radiotron. Every one guaranteed new and perfect. We will ship brand in stock unless you specify otherwise.

N105 Detector UV200 C300 Each ..... $4.18
N112 Amplifier, UV201A C301A. Each ..... 5.42
N118 5-Watt Transmitter.. 7.70
N107 WD11 C11. Each.... 5.42
N101 WD12 C12. Each.... 5.42
N102 UV199 C299. Each..... 5.42
N104 UV199 Adapter fits 199 tube to standard socket ..... .39
N108 WD11 Socket. Each..... .31
N109 WD11 Adapter. Each..... .45

### BAKELITE TUBE SOCKET



N140 Standard base...39c
N141 UV199 base.....39c
Moulded of genuine red brown bakelite. Binding post connections. For table or panel mounting. Neat and strong.

### 199 SOCKET

N145 Each.....49c
Moulded of high insulating material. Sponge rubber base prevents ringing in tube. Plainly marked binding post connections. Neat and compact.

### STANDARD TUBE SOCKET

N150 Each.....59c
Bakelite base. Polished nickeled tube. Highest quality socket on the market. Best insulation. Positive contact. Marked terminals. For base or panel mounting.

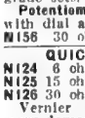
### FILAMENT CONTROL RHEOSTATS

N132 6 ohm. Each.....38c
N129 20 ohm. Each.....40c
N131 30 ohm. Each.....44c
N135 6 ohm Vernier...95c
Best grade. Will give real service. Durable and lasting. High heat resisting base, diam. 2⅛ in. Tapered polished black knob 1¼" diam.
**Potentiometers.** Match above rheostats. Same high grade construction.
N151 200 ohm. Each.....50c
N152 400 ohm. Each.....55c

### OTHER STANDARD BRAND RHEOSTATS and POTENTIOMETERS

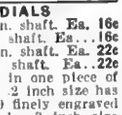
N207 Filkostat. Each ..... $1.90
N208 Bradleystat. Each ..... 1.74
N209 Bradleyometer 200 ohm. Each.. 1.89
N210 Bradleyometer 400 ohm. Each.. 2.89
N211 Howard 6 ohm Plain Rheo. Ea. .85
N212 Howard 6 ohm Ver. Rheo. Ea. 1.25
N213 Howard 25 ohm Plain Rheo. Ea. .85
N214 Howard 25 ohm, Ver. Rheo. Ea. 1.25
N215 Howard 40 ohm Plain Rheo. Ea. .85
N216 Howard 40 ohm Ver. Rheo. Ea. 1.25
N217 Howard 200 ohm Potentiometers. Each ..... 1.25
N218 Howard 400 ohm Potentiometers. Each ..... 1.69
N219 Klosner 6 ohm Vernier. Each.. 1.19
N221 Klosner 30 ohm Vernier. Each 1.45
N222 Amperite with mounting..... .95

### SUPERIOR RHEOSTATS



N153 6 ohm. Each.....69c
N154 20 ohm. Each.....76c
N155 30 ohm. Each.....83c
The finest rheostat. Smooth, even action. Best design, best workmanship. Supplied with attractive dial and knob. A rheostat for high grade sets.
**Potentiometers** to match above rheostats with dial and knob.
N156 30 ohm ..... 98c

### QUICK ACTING RHEOSTAT



N124 6 ohm. Each...79c
N125 15 ohm. Each...88c
N126 30 ohm. Each...99c
Vernier adjustment at every degree of resistance. Pushing knob in turns off the filament.

### COMPOSITION DIALS

N921 Diam. 2 in. for 3-16 in. shaft. Ea. 16c
N922 Diam. 2 in. for ¼ in. shaft. Ea...16c
N923 Diam. 3 in. for 3-16 in. shaft. Ea. 22c
N924 Diam. 3 in. for ¼ in. shaft. Ea..22c
Handsome dials moulded in one piece of polished black composition. 2 inch size has 270° scale marked 0 to 100 finely engraved in contrasting white enamel. 3 inch size has 180° scale marked 0 to 100.

### BAKELITE DIALS

N931—2 in. Diam for 3-16 in. shaft. Each..35c
N932—2 in. Diam. for ¼ in. shaft. Each....35c
N933—3 in. Diam for 3-16 in. shaft. Each...39c
N934—3 in. Diam for ¼ in. shaft. Each....39c
N935—4 in. Diam. for ¼ in. shaft. Ea. 48c
Moulded in one piece of genuine bakelite in polished black finish. Finely engraved scale in contrasting white enamel. Sure grip knob that fits the fingers. Higher grade dials for good sets. Match perfectly.

### VERNIER DIAL ADJUSTER

N941 Each.....19c
Easily installed at edge of dial, gives finest vernier adjustment of condenser or inductance. A great value. Polished black knob.

## WE PAY TRANSPORTATION CHARGES EAST OF THE ROCKIES

**PRESERVE THESE PAGES—ORDER FROM THEM AND SAVE MONEY**
**FAST SERVICE—TRY US AND BE CONVINCED**
**THE PRICES QUOTED DELIVER THE GOODS TO YOUR DOOR**

**OUR GUARANTEE PROTECTS YOU—We handle only the best goods, carefully tested and checked by expert radio engineers. You are assured of getting guaranteed apparatus that will give superior results. And while our goods are best, our prices are lowest. Our goods equal or surpass the claims we make for them. We do not attempt to deceive or mislead. Our reputation for fair dealing is our most valued asset.**

**HOW TO ORDER—Write your Order plainly, state Article Number, Description and Price of items wanted. Send Postoffice or Express Money Order, Certified Check or Bank Draft for Total of Order. Prompt Shipment is assured when these directions are followed.**

### ENCLOSED DETECTOR

One of the finest crystal detectors on the market, supersensitive galena crystal enclosed in heavy glass shield. Quick, positive adjustment. Brass parts polished nickel finish.
N730 Each.....89c

### GALENA DETECTOR

Easy fine adjustment. Crystal mounted in cup. Moulded base and knob. Brass parts polished nickel finish. An unequaled value.
N732 Each ..... 59c

### DETECTOR CRYSTALS

N736 Galena, Arlington tested, piece 19c
N738 Silicon, Arlington tested, piece 19c
N735 Tested, Galena, Mounted, piece 9c
N737 Tested, Silicon, per piece..... 9c
N739 Genuine million point crystal. Ea. 29c

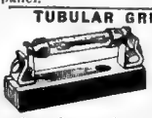
### STANDARD BRAND FIXED CRYSTAL DETECTORS

The latest development in Crystal Detectors. **Give better results and more reliable than old style. Used in Reflex circuits.**
N742 Grewol Detector. Each.....$1.48
N743 B Metal Detector. Each..... 2.18
N744 B Metal Crystal. Each..... 1.28
N741 Gold Grain Detector. Each.... .83
N745 Yellow Tip Detector. Each.... 1.79
N746 Du-Tec Crystal. Each..... .27

### SUPERIOR VARIABLE GRID RESISTANCE

N167 Each .....80c
N168 With .00025 Condenser .....98c
Eliminates hissing, clarifies signals. Capacity smoothly varied from 0 to 6 megohms by half turn of knob. Easily mounted on any panel.

### TUBULAR GRID LEAKS AND CONDENSERS



Very convenient Permit of quick change of leaks or condensers of varying capacity. Cut shows leak mounted. Leaks and condensers have same appearance. Each part priced separately.
N849 Grid Leak. Each.....15c
**Resistances**—½, 1, 1½, 2, 5, 7, and 10 megohms. Specify which size is wanted.

N831 Grid and Plate Condensers. Ea. 39c
**Capacities** .000025, .0001, .00025, .0005 mfd. Specify which size is wanted.

**Mountings.** Bakelite base.
N840 Single mounting. Each.....28c
N842 Double mounting. Each.....47c
N844 Triple mounting. Each.....67c

### STANDARD BRAND VARIABLE GRID LEAKS

N177 Freshman back of panel style.....59c
N178 Freshman back of panel style with .00025 Condenser 79c
N171 Freshman base mounting type with .00025 Condenser..79c
N172 Durham Variable Grid Leak with Mounting ..... 89c
N173 C.R.L. Variable Grid Leak...$1.19
N175 C.R.L. Variable Grid Leak with grid condenser ..... $1.48

### FRESHMAN MICA CONDENSERS

| | | | |
|---|---|---|---|
| N512 | .00025 mfd...26c | | |
| N513 | .0005 mfd....26c | | |
| N514 | .001 mfd.....31c | | |
| N515 | .002 mfd.....31c | | |
| N516 | .006 mfd.....60c | | |
| N517 | .01 mfd.....80c | | |

### DUBILIER MICADON TYPE 601

| | | | |
|---|---|---|---|
| N502 | .0001.....28c | N507 | .0025.....32c |
| N503 | .00025.....28c | N508 | .003.....40c |
| N504 | .0005.....28c | N509 | .004.....40c |
| N505 | .001.....32c | N510 | .005.....48c |
| N506 | .002.....32c | N511 | .006.....60c |

### SUPERIOR RADIO JACKS

**Finest grade jacks.**
Improved design. Best materials. Phosphor bronze springs. Silver contact points. Nickel finish. Mount on panels ⅛ to ⅝ in.
N390 Open circuit. Each.....38c
N391 Closed circuit. Each.....45c
N392 Two circuit. Each.....54c
N393 Single circuit filament control..52c
N394 Two circuit filament control....68c

### STANDARD JACKS AND PLUG

N387 Open circuit jack. Each.....27c
N388 Two circuit jack. Each.....35c
N396 Plug takes two sets of phones..35c
Well made, durable, smooth working, nickel finished frame. Well insulated.

### SUPERIOR RADIO PLUGS

N395 With set screws for fastening cord. Each....35c
N397 Two-way — takes two pair any style cords. Lists for $1.00. Each.....59c
Highest grade plugs. Fit any standard jacks. Polished round barrels.

### SWITCH CONTACT POINTS

Brass polished nickel finish. All have ⅝ in. long size 6-32 screws and two nuts. All prices the same.
**Dozen 15c** **Hundred $1.00**
Order by Article Number.
N360 Head, ¼" diam.; ¼" high
N362 Head, 3-16" diam.; ⅛" high
N363 Head, 3-16" diam.; 1-16" high
**Solder Lugs to Fit Contact Points**
Also for connecting wires to binding posts, etc.

N365 **Dozen 8c** **Hundred 30c**

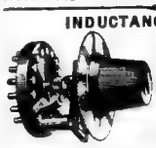
### SWITCH LEVER STOP

Brass polished nickel finish.
N386 **Dozen 18c** **Hundred $1.05**

### SWITCH LEVERS

Very neat polished black composition knob. Exposed metal parts polished nickel finish. Fitted with panel bushing and two set nuts. A high grade switch.
N381 1¼" Radius. Each 14c

### INDUCTANCE SWITCH



N285 Price including knob and dial..$1.27
Mounts switch points and contact lever behind panel. Only one hole needed to mount. 15 switch points, any number of which may be used.

### BINDING POSTS

Brass, polished nickel finish. Washer and 6-32 in. screw extending ⅝ in.
N370 Large size—barrel and knob ¾" long. Dozen .....70c
N370-2-4 N372 Smaller size— N376-8 barrel and knob 9-16" long. Dozen..70c
N374 Large size with composition knob Dozen .....45c
N376 Large size with hole for phone tip or wire. Dozen .....80c
N378 Small size with hole for phone tip or wire. Dozen .....35c

### SUPERIOR INDUCTANCE SWITCH

N288 Each.....85c
Quickly and securely mounted by drilling one hole. Only knob and pointer show in front of panel. Connections can be soldered before fastening switch, making assembly much easier.

### BARAWIK QUALITY HEADSETS

N770 Per Set, 2000 ohms.....$2.98
These headsets have proven on rigid tests to be one of the very best on the market. The tone quality is excellent with an unusual volume. Skilled workmen make them from only the best selected materials. The receiver cases are fine polished finish with polished black ear pieces. Fabric covered head band comfortably and quickly fitted to the head. Supplied with 5-foot cord. These sets were designed to sell for much higher prices than we ask, and at our price are a wonderful bargain. We guarantee that you will be pleased with them and agree that they are the best value by far yet offered. If they don't suit you we will cheerfully return your money.

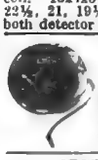
### STANDARD BRAND HEADSETS

N754 Baldwin Type C with universal jack plug $10.45
N758 Western Electric $9.50
N764 Frost, 2000 ohm $3.30
N766 Frost, 3000 ohm $3.95
N759 Federal .....$5.50
N756 Red-Head, 3000 ohm .....$5.78
N768 Brandes, 2000 ohm.....$4.90
N769 Brandes, 3000 ohm .....$6.75
N751 Murdock 56, 2000 ohm.....$3.25
N752 Murdock 56, 3000 ohm.....$3.80
N759 Dictograph Aristocrat .....$6.60

### PLATE CIRCUIT "B" BATTERIES

You can make real savings on these batteries. We guarantee them to equal any on the market regardless of price. Extra long life. Don't throw away your money on cheaper inferior useless batteries.
N180 Signal Corps type, small size. 15 cells, 22½ volts. Each.....$1.10
N182 Large size, 5 taps 16½, 18, 19½, 21 and 22 volts. Each.....$1.45
N184 Variable Large Navy size, 16½x4x3 inches 5 taps, giving range from 16½ to 22½ volts in 1½ volt steps. Each $1.95
N188 Combination Tapped 45 volts, 30 cell, 13x4x5 battery. Tapped to give 45, 22½, 21, 19½, 18 and 16½ volts. Handles both detector and amplifier tubes. Ea. $3.28

### "B" BATTERY METER



N189 Each .....98c
Reads 0 to 50 volts. Accurately tells you the exact condition of your B Battery. Convenient watch size. Polished nickel case with wire lead.

### STORAGE "A" BATTERY

A high grade battery. Guaranteed for three years. Made of best new materials. Full capacity. The best battery buy on the market. Try one of these batteries on your set for 10 days. If at the end of that time you are not fully satisfied with the battery return it and we will refund the purchase price.
N194 6 volt, 40- 80 ampere size. Ea. $ 9.90
N196 6 volt, 80-120 ampere size. Ea. $13.25

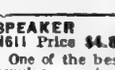
### HOMECHARGER BATTERY CHARGING RECTIFIER

Charge your battery at home over night for a few cents. Simply connect to any 110 volt 60 cycle light socket, turn on current and rectifier does the rest automatically. Will work for years without attention. Simple connections. Give a tapering charge which batteries should have. You can make it pay a profit charging your friends' auto batteries. Long connecting cords with pair of battery clips.
N201 For 6 volt battery.....$12.95
N203 For 12 volt battery..... 12.95

### HYDROMETER

N190 Each .....48c
Accurately tells you the condition of your storage battery. Helps you keep your battery in better condition.

### BATTERY CLIPS



N198 Two for .....28c
Clip onto storage battery terminals, lead coated. Make positive non-corrosive contact at all times.

### WIRE CONNECTING CLIPS

N199 Per dozen .....30c
Small connecting clips for quickly fastening leads onto binding posts, etc. Handy and useful. Every radioist should have at least a dozen.

### MELOTONE LOUD SPEAKER

N611 Price $4.85
One of the best popular priced speakers. Talks loud and clear. Compares favorably with more expensive makes. Fibre horn. Heavy metal base. Five foot cord. Nickeled goose neck. 6⅝ in. bell. Size over all 14½".

### STANDARD BRAND LOUD SPEAKERS AND UNITS

N610 Murdock Loudspeaker .....$4.38
N613 Barawik with Baldwin unit... 11.25
N615 Pathe Loudspeaker ..... 15.95
N616 Atlas Loudspeaker ..... 22.50
N612 Magnavox R3 Loudspeaker.... 32.50
N614 Magnavox M1 Loudspeaker... 32.50
N617 Music Master Loudspeaker....27.00
N755 Genuine Baldwin type C unit.. 5.10
N619 Murdock Special Unit..... 2.60
N618 Brandes Table Talker..... 8.75
N620 Baldwin Loud Speaker..... 22.50
N609 Dictograph Dictograd ..... 21.50
N608 Atlas Unit. Each..... 10.75
N607 Western Electric Unit. Each.. 10.75

### PHONODAPTER

N771 Each.....39c
The Phonodapter will fit any phone. Metal tube fits any standard phonograph. Make your phonograph a loud talker. Fits Columbia, Victor and Sonora phonographs. Is made entirely of pure soft rubber with brass tube insert.

# THE BARAWIK CO. Chicago's Original ... Supply House ... Imitators 102 South Canal St., Chicago, Ill.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# IT IS EASY TO BUILD YOUR OWN RADIO SET

**GUARANTEED QUALITY GOODS**
at money saving prices. There are no strings tied to our prices. Order what you want—be your order large or small. You will get immediate service from the most reliable exclusive radio supply house. Before you consider buying elsewhere, ask your banker as to our responsibility and financial rating. You will find that we stand high in the commercial world and we have earned our standing only through fair dealing, prompt service and by offering merchandise of high quality at prices unequalled by others.

### FAHNESTOCK CONNECTORS

N366 N367

N366 Single. Dozen .....25c
N367 Double. Dozen .....39c
Handy and convenient for connecting wires or making connections on binding posts or other parts of instruments. Wires held firmly in spring grip but may be instantly removed.

### UNIVERNIER CONTROL DIAL

N918 For 3-16 inch shaft.....$1.15
N919 For ¼ inch shaft.....1.15
Replaces ordinary knob or dial. Gives perfect vernier control on condenser, variometer, variocoupler, tickler, etc. Positive easy action. Looks fine. Easily installed. Especially desirable in tuning neutrodyne sets.

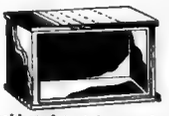
### RADIO SWITCH

N287 Each .....28c
Cuts current on and off instantly by a push or pull. Very neat. Well made. Durable. Saves tubes and batteries.

### BEZELS

N399 Diameter ¾ inch. Each.....15c
N400 Diameter 1½ inch. Each.....15c
Polished nickel finish. Finest quality. Fit any thickness panel. Greatly improve appearance of panel.

### CABINETS


Fine looking cabinets solidly built. Elegant hand rubbed dark mahogany finish. You will be proud of your set mounted in one of these cabinets. Hinged tops. Front rabbeted to take panels. Panels not included. Prices are transportation paid. Note that our prices are prepaid.

| Panel Size | Inside Dimensions High | Wide | Deep | Art. No. | Price Each |
|---|---|---|---|---|---|
| 6x 7" | 5⅛" | 6⅛" | 7" | N420 | $1.95 |
| 6x10⅛" | 5⅛" | 10 " | 7" | N422 | 2.45 |
| 7x10" | 6⅛" | 9⅛" | 7" | N421 | 2.60 |
| 7x12" | 6⅛" | 11⅛" | 7" | N424 | 3.05 |
| 7x14" | 6⅛" | 13⅛" | 7" | N423 | 3.20 |
| 7x18" | 6⅛" | 17⅛" | 7" | N426 | 3.45 |
| 7x21" | 6⅛" | 20⅛" | 7" | N425 | 3.85 |
| 7x24" | 6⅛" | 23⅛" | 7" | N429 | 4.35 |
| 7x26" | 6⅛" | 25⅛" | 7" | N431 | 5.50 |
| 9x14" | 8⅛" | 13⅛" | 10" | N428 | 3.55 |
| 12x14" | 11⅛" | 13⅛" | 10" | N430 | 4.00 |
| 12x21" | 11⅛" | 20⅛" | 10" | N432 | 5.05 |

### RADIO "BAKELITE" PANELS

Notice our very low prices on this fine quality material. Others ask as much for hard rubber panels which are worth much less. We supply genuine Bakelite, Condensite Celeron or Formica, all of which are materials with practically identical mechanical, chemical and electrical properties. Machines well without chipping. Won't warp. Waterproof. Highest mechanical and dielectric strength. Attractive natural polished black finish which can be sanded and oiled. Note that our prices are prepaid.

| Panel Size Inches | ⅛" thick Art. No. | Price | 3-16"thick Art. No. | Price | ¼" thick Art. No. | Price |
|---|---|---|---|---|---|---|
| 6x 7 | N450 | $0.55 | N460 | $0.69 | N470 | $1.15 |
| 6x10⅛ | N451 | .86 | N461 | 1.10 | N471 | 1.73 |
| 7x14 | N458 | 1.38 | N468 | 1.73 | N478 | 2.76 |
| 7x18 | N453 | 1.78 | N463 | 2.27 | N473 | 3.56 |
| 7x21 | N457 | 2.05 | N467 | 2.65 | N477 | 5.10 |
| 7x24 | N459 | 2.42 | N469 | 2.97 | | |
| 7x26 | | | N462 | 3.25 | | |
| 9x14 | N454 | 1.85 | N464 | 2.35 | N474 | 3.56 |
| 12x14 | N455 | 2.42 | N465 | 2.97 | N475 | 4.78 |
| 12x21 | N456 | 3.62 | N466 | 4.25 | N476 | 7.13 |

### RUBBER COMPOUND PANELS

Made of a special compound having a rubber base. Equal in appearance and in all essential points to any other class of panels. Fine smooth polished finish. Can be drilled or cut without chipping. Guaranteed not to warp and to be a perfect insulator for radio use. Smooth, clean edges. Thickness 3/16 inch. Size given is in inches.

N481 7x10...$0.88 N484 7x18...$1.60
N482 7x12... 1.05 N483 7x21... 1.85
N483 7x14... 1.22 N486 7x24... 2.10

### PANELYTE RADIO PANELS

A new practical radio panel. High dielectric strength, rigid and durable. Easy to drill, tap or refinish. Black in color, polished on one side, matte grain on other side. 3-16 inch thick.

N487 7x10....72c N490 7x18...$1.28
N488 7x12....84c N491 7x21... 1.44
N489 7x14....96c N492 7x24... 1.69

## Over 30,000 Barawik Radio Sets Are Operated All Over the World

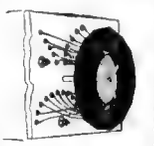
All of these sets were built with Barawik Standard Radio Parts mostly by persons without any previous radio experience. These home-made sets equal in results the best factory made sets—many are even superior and at a cost only a fraction of the cost of the factory made sets. You can easily equal these results by following directions given in the numerous magazine articles on radio. Also directly below you will find listed Blue Prints, Instruction Packs and Books. With the help of these anyone can successfully make a Radio Set.

### RADIO BOOKS

That every Home Builder and Amateur needs. Written in plain simple language everyone can understand.

N631 100 Radio Hookups. Each.....25c
Shows hookups from the simple crystal set to the more elaborate and latest tube circuits. Numerous types of Reflex super-Regenerative, super-Heterodyne, Neutrodyne, Reinartz, Flewelling, Bishop, etc.
N632 How to Tune Your Radio Set. Each .....25c
N633 How to Build Loud Talkers. Each .....25c
N634 How to Make Radio-Phone Receiving Sets. Each.....25c
N635 How to Make Radio Frequency Amplifiers. Each .....25c

### SPIDER WEB COIL FOR REINARTZ CIRCUIT


N296 Each ....$1.15
Lists for $2.50. A very unusual bargain. Made of green silk covered wire, spider-web wound to produce greatest efficiency and lowest losses. 21 taps so arranged that crossing is avoided. Two fibre strips and wooden rod furnished permit various styles of mounting. With this coil a high grade set can be built at a low cost. Directions included

### ULTRA AUDION COIL

N297 Each .....85c
Spider web wound of green silk covered wire. Four taps. Produces wonderful results. Fibre strips and wooden rod for mounting included. Directions furnished.

### COCKADAY COILS

N298 Per Set ...$1.95
Compelte set coils for Cockaday circuit. Properly calculated and made to give best results on this new wonder circuit.

### NEUTRODYNE TRANSFORMERS

N571 Each $1.75. Per set of three..$4.95
An air core transformer for use in neutrodyne method of reception. Can also be used for tuned radio frequency or as a fixed coupler with condenser across secondary. Proper design for results and efficiency. Green silk windings on bakelite tubes with adjustable mounting brackets to fit most any condenser.

### NEUTRALIZING CONDENSERS

N572 Per set of two .....40c
Simple, inexpensive, effective precision type. Micrometer adjustment is attainable. Easily mounted in circuit.

### STANDARD NEUTRODYNE PARTS

N851 WorkRite Neutroformer (combined transformer and condenser). Each....$4.78

N852 WorkRite Neutrodyne Kit....$14.95
Includes 3 WorkRite Neutroformers, 2 WorkRite Neutrodons, panel layout, paper template and book of instructions.

N854 Amsco Compensating Condenser. Each .....$2.89
A 3 electrode condenser for balancing the grid charge on amplifying tubes. Stops all local oscillations without detuning amplifier. Shielded against hand capacity. Complete with 2 inch dial. Provides perfect and rapid control of tube.

N853 WorkRite Neutrodon. Each.....43c
A very accurate and easily adjusted condenser for neutralizing tube.

N855 Fada Neutrodyne Parts.....$25.00
A combination package of three neutroformers and two neutrodons with instruction book.

N856 Fada Parts for 4 tube set. Complete .....$64.00
N857 Fada Parts for 5 tube set. Complete .....$65.60
Contain all necessary parts including drilled panel, careful instructions, sockets, dials, condensers, transformers, bus bar wire and fine mahogany finish cabinet.

### ANTENNA LEAD-IN

N259 Each.....25c
Solves a hard problem. With it you can bring in the antenna wire without drilling a hole for an insulator. Place on window sill and window can be closed down tight and locked as before. Takes but a minute to install. Perfectly insulated. Can be bent into any shape. Made of copper strip properly insulated. Neat and durable.

We offer our agents 20 percent discount on nearly all standard goods not listed on these pages. Send us your order—we give you the right price.

### PRINTS OF POPULAR CIRCUITS

These prints give a full-size panel layout schematic hookup, hook-up showing parts wired and explanatory notes. With them as a guide anyone can build a set that will operate perfectly and bring in the long distance stations.

N621 One Tube Reflex and Amplifier. Each .....10c
N622 Single Circuit Tuner. Each....10c
N623 Reinartz Tuner using Spider Web Coil. Each.....10c
N624 Radio and Audio Frequency Amplifier. Each .....10c
N625 Short Wave Regenerative Set, using two Variocouplers. Each.....10c
N626 Honeycomb Coil Circuit and Amplifier. Each .....10c

### "CONSOLIDATED" RADIO PLAN PACKETS

Designed and laid out by the foremost radio engineers. With their help you can build an outfit that will give the finest results. Every packet contains complete instruction for the construction and tells what tools and parts are needed. Detailed directions for drilling, mounting and wiring, also how to handle set after it is built. Thousands of sets have been built from these plans and are in perfect operation. Folder giving detailed description of each packet sent on request. For more complete description of these packets see the Consrad Co. advertisement in this magazine.
Price per packet .....42c
**Order item wanted by article number.**
N640 How to make a Neutrodyne Receiver.
N641 How to make a Reinartz Receiver.
N642 How to make a Regenerative Receiver.
N463 How to make a Cockaday Receiver.
N644 How to make a Reflex Receiver.
N645 How to make Detector and Amplifier Units.
N646 All about aerials and their construction.
N647 Twenty Radio Diagrams of Latest Hook-ups.
N648 14 Radio Formulas and Diagrams.
N649 How to make an Autoplex Receiver.

## Complete Sets of Parts for Popular Circuits

Only high grade parts are used in these sets and each part is guaranteed to be perfect. Each one of these circuits has been tried and successfully operated under many different conditions. The detailed instructions and diagrams supplied with each set make it easy for any one without previous experience to build an outfit that will give most satisfactory results.

### HAZELTINE NEUTRODYNE 5 TUBE CIRCUIT

N858 Complete set parts.....$38.50
Essential parts licensed under Hazeltine patents. A set that will give really wonderful results. Only the highest grade parts are used. The following items are included:
1—7x24x3-16 Formica panel.
3—Rheostats with dials.
3—4 inch Bakelite dials.
5—Bakelite sockets.
8—Composition top binding posts.
3—.0005 Bakelite end variable condensers.
1—7x24 high grade cabinet.
3—Neutroformer transformers.
2—Neutralizing Condensers.
1—Variable grid leak and condenser.
2—Barawik audio transformers.
1—Base board for mounting.
30 ft. tinned bus bar wire.
Instructions for assembling and wiring.

### ERLA SINGLE TUBE REFLEX CIRCUIT

N859 Complete set parts.....$18.95
The following parts are included:
1—Erla Reflex No. 1 Transformer.
1—Audio Transformer.
1—Variocoupler silk windings on bakelite tube.
1—.0005 Bakelite end Variable Condenser.
2—Bakelite standard base sockets.
1—.002 Mica condenser.
1—.001 Mica condenser.
1—.00025 Mica condenser.
1—Fixed detector.
1—High grade rheostat.
2—3 inch polished black dials.
8—Binding posts with composition tops.
1 dozen switch points and 4 stops.
2—Switch levers.
1—7x14x⅛ Bakelite panel.

N423 Fine 7x14 Cabinet mahogany finish. Extra .....$3.20

### AUTOPLEX CIRCUIT

N860 Complete set parts .....$13.25
A single tube circuit that brings in signals loud enough for a table talker. The following parts are included:
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1—7x12x⅛ Bakelite panel.
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1—1250 turn honeycomb coil.
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1—6 ohm rheostat.
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1—Vernier 6 ohm rheostat.
8—Binding posts with composition top.
1—Base board for assembling.
Instructions for assembling and wiring.

### REINARTZ CIRCUIT

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1—Bakelite socket standard base.
1—Vernier Rheostat.
1—.0005 Bakelite end variable condenser.
1—.00025 Bakelite end variable condenser.
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3—Switch levers.
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Note:—The above does not include amplifier. Set can be supplied with 2 additional sockets, 2 audio transformers, 2 additional rheostats, and size 7x21 panel.
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1—Vernier 6 ohm Rheostat.
1—Variable grid leak with condenser.
8—Binding posts with composition tops.
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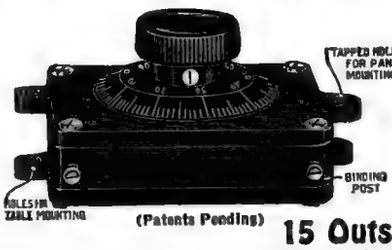


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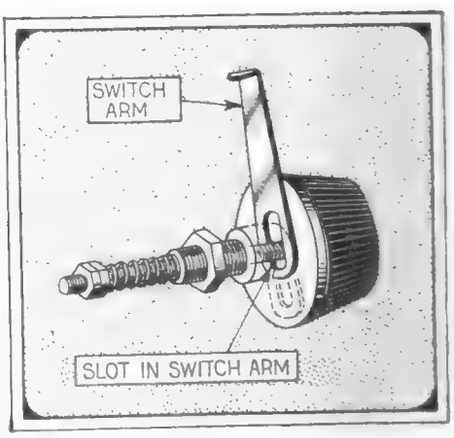
## Phonograph Record Set

The above illustration shows a complete receiving set, including tuner and detector, mounted on a standard 12-inch phonograph record. The tuner consists of an inductance coil and three variable condensers. One of the latter is of the book type, operated by a cam, and is mounted within the inductance coil. If desired, a standard type of condenser may be used in this place, providing the inductance coil is wound on a tube large enough to contain the condenser. With a little ingenuity, almost any type of receiving set may be mounted on a record in this manner and be made to give very good results. Some type of mounting should be devised and this could probably take the form of two brackets which would support the record on edge. Another good scheme would be to make a round box, the bottom composed of a circular disc of wood and the sides of the thin wood used in making cheese boxes. This could readily be bent into the shape required and the phonograph record mounted at the top of this box. Such a set would not only be useful, but ornamental and novel. —A. O. Wright.

## Adjustable Switch Arm




No more need the amateur drill holes for switch points on his panel and then find that the switch arm will not reach to them or is a little bit too long. The use of the adjustable switch arm illustrated above eliminates this possibility. A slot is cut in the arm as shown and a threaded collar holds the same firmly in place. By loosening the collar, the length of the arm may be adjusted. This switch is now on the market and the above illustration shows all the constructional details.

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## Dr. Hackensaw's Secrets

(*Continued from page* 1055)

see this eight months old baby attempting to smoke a cigarette, or sucking a cocktail from her milk-bottle. One day she asked to see her children and grand-children, wishing to be held by each in turn, and she took a malicious pleasure in striking them and scratching their faces, to make up for the many times they had done the same to her when they were babies.

And still she grew younger. Doctor Hackensaw would spend hours pacing the floor, with this baby widow in his arms, reading her the newspaper or passages from Milton's "Paradise Lost." Meanwhile his powerful brain was striving hard to devise some means to check the fatal catastrophe that seemed about to terminate the experiment which had begun so favorably.

### THE LAST MEASURE

When the baby was only five days old, Doctor Hackensaw prepared a baby incubator, and by the time she was minus one day old she was duly installed in her new dwelling. Her rate of rejuvenation had now decreased and she went back through the prenatal stages at about the same rate as she had originally come through them eighty-five years previously. When the *foetus* was about seven months old, Doctor Hackensaw transferred it to a glass jar full of a suitable culture-fluid, and watched with growing anxiety as she reverted to the tadpole stage, with a well developed tail and gill-slits. It was evident that Mrs. Young would soon be nothing more than the original egg-cell from which she had started. And then what would happen? Would she vanish into nothingness?

Doctor Hackensaw determined on one final effort. He had carefully preserved the few drops of blood he had originally taken from the lady's arm. The *foetus* was now so minute it could only contain a relatively small number of the microbes of youth. The doctor resolved to risk everything in one final attempt. By the use of an anaesthetic, he endeavored to stop the activities of the microbes, and then introduced into the *foetus* the drops of blood he had preserved. And then he waited. Anxiously he watched. To his joy he saw that the process of growing younger had ceased. Two, three days passed, and then the *foetus* began to grow again in the normal manner. Nine months later Mrs. Young was a normal baby again, but her rate of growth now was that of an ordinary child, and she was obliged to pass through all the phases of childhood and youth and finally, at the age of twenty—or, rather, when one hundred five years old—married James Trimble, the grandson of the man to whom she had been originally engaged.

But Dr. Hackensaw gave up his search for the secret of perpetual youth. Of course, to a scientist, it would be a great advantage to remain alive and young for a thousand years or more.

On the other hand, think what a disadvantage it would be to the human race, if all men had an indefinite tenure of life. Progress would be greatly checked; for old ideas and habits are difficult to eradicate. It is the new generations, freed from the prejudices of their parents, that carry the race forward.

Then, too, the physical and mental powers of the race would remain stationary. It is by the survival of the fittest in the past ages, that man has obtained his wonderful intellectual powers, and it is only by the survival of the fittest in coming generations that he can hope to increase them.

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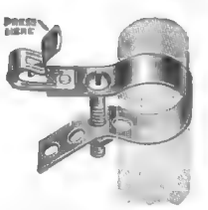

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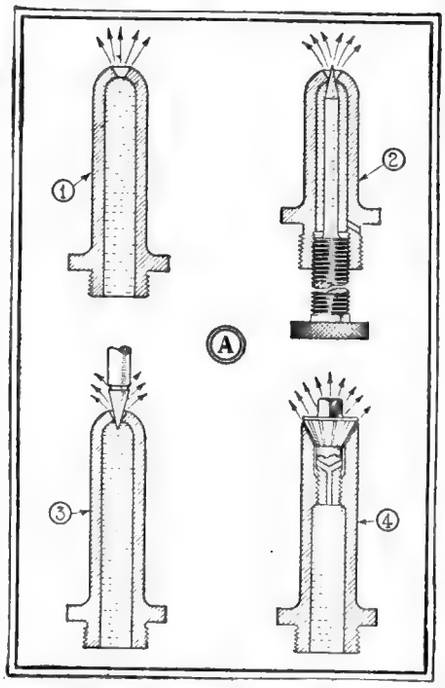
# Motor Hints

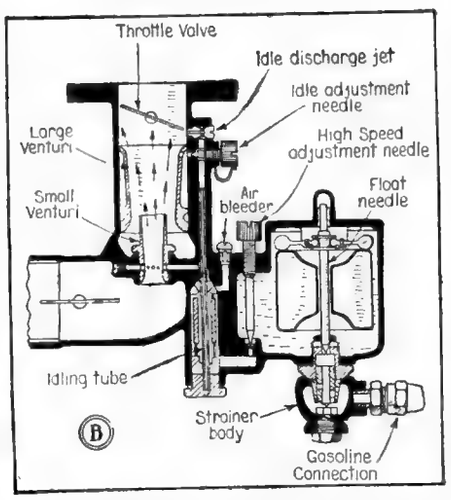
## Carburetion and Carburetor Adjustments

By TOM C. PLUMRIDGE

Automotive Expert




The basis of good operation in an automotive engine is good compression. The basis of economical operation of the same engine is, however, dependent upon good carburetion. One of the most important parts of the carburetor is the spray, or jet that throws the gasoline out into the current of air. Above is illustrated four principal types of jets. At 1 is the plain type which consists of a hollow tube with an aperture at the top. At 2 is a more efficient variety. The internal needle screws up into the hole forcing the gasoline into a better spray. The same principle is used in the spray at 3. The needle fits onto the top instead of beneath the hole. At 4 is the cone type, where a cone is substituted for a needle.




To help vaporization, and suck out the gas from the jet and to thoroughly mix the gas and air, a venturi, or choke tube is used. It is of peculiar shape and formed so that there is a greater velocity of air through the carburetor without restriction. Sketch "B". The air passes through the venturi in a whirling motion which sucks the gasoline from the jet, a small vacuum is formed in the middle of the tube and the gasoline entering this is thoroughly vaporized. The sides of the tube are heated and the gasoline particles that fall on them are vaporized so that all particles are used providing the gasoline is supplied in the correct quantity. The Stromberg carburetor is one that is widely used. This make of carburetor has two adjustments on some models and on others it has three. They are high speed, low speed or idling jet, and the economizer. Sketch "B" shows very plainly the flow of gasoline through the carburetor, and also shows the different positions of the adjustments.

The Improved MIRACO

GETS 'EM FROM COASTS TO COASTS

Clearly and distinctly, too! For our users tell us that Cincinnati hears Frisco, Denver hears Schenectady, New York hears Havana! Scores of long distance records were made on these instruments last year so with the many new refinements incorporated the result obtained now will be far better than ever.

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This has always been the MIRACO key-note and the thousands of sets now in use are a fitting tribute to MIRACO'S excellent performance. Many new improvements, such as new sockets resting on shock-absorbing pads—a refinement found only in the most expensive sets—rheostats with multiple resistance windings, making it possible to use either dry cell or storage battery tubes, and a new aluminum shield that prevents annoying body capacity effects, are embodied.

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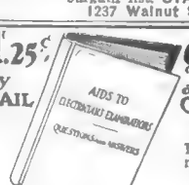


QUESTIONS and ANSWERS

Electricians' Examinations

Diagrams, symbols, tables, notes and formulas for preparation for license.

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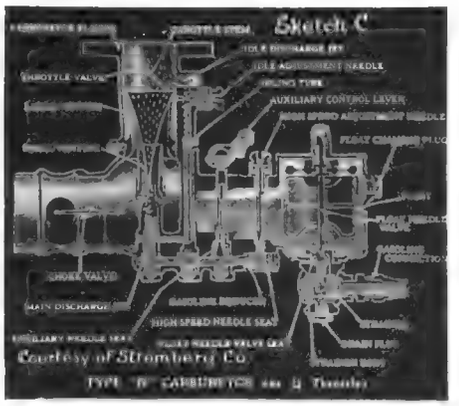
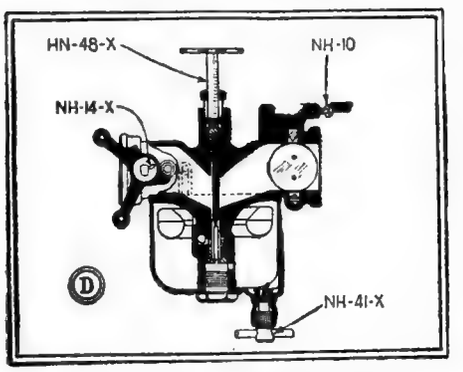
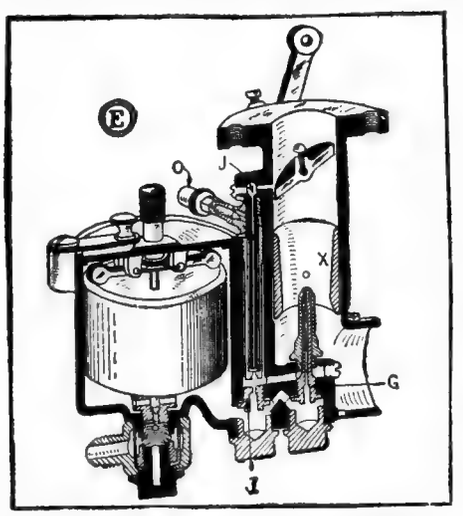



If this sketch is compared with sketch "B" it will be noticed that there is a little different arrangement in sketch "B". The small venturi acts as a jet, but in sketch "C" a jet is used. If the venturi is enlarged in size the amount of air is also increased. The size of the venturi is determined at the factory and should never be changed. Before any attempt be made at adjustment the engine should be run until thoroughly warmed up to normal operating temperature. Although there are several different models of this make of carburetor they are all adjusted in the same manner.




The Holley carburetor is the kind that is fitted to Ford cars and is of the external needle type, and is one of the easiest to make adjustments on. Referring to sketch "D," the adjustment needle HN 48 X is the only adjustment as far as gasoline regulation is concerned, and the adjustment is made as follows: After the engine has thoroughly warmed up set the ignition lever a little below half advance and the throttle slightly open, screw in the adjustment HN 48 X, until the engine starts to slow down or miss fire, then screw out until the engine runs evenly.




The Zenith carburetor is one that has one adjustment; this is the slow speed or idling adjustment. Referring to sketch "E," after the engine has warmed up, the idling adjustment is made by screwing in the screw O to give less air, and outward to give more air. This screw controls the suction in the idling tube J, through which the gasoline is drawn when the engine is running at idling speed. The sizes of the choke tube X, the compensator I, and the main jet G, are determined at the factory and should not be altered.

(*Continued on page* 1065)


# Reduce Tubes by Half

## With Erla Synchronizing Transformers

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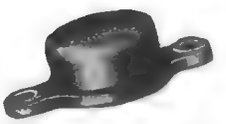
1 = 3
2 = 4
3 = 5

*Vacuum Tubes as Ordinarily Employed —*

Increased amplification and elimination of distortion inevitably follow installation of Erla transformers. Reflex and cascade types. $5

Erla audio transformers add tremendously to the purity and volume of any receiving unit in which they are used. Ratios 3½ and 6 to 1. $5



Crystal troubles vanish on installing an Erla rectifier. No adjustment required. Proof against jolt and jar. Lasts indefinitely. List $1

*Jobbers*—Sweeping success of Erla circuits fosters continually increasing demand for Erla products. Write for terms and discounts.

### *Nation Wide Loud Speaker Reception With Only Three Tubes*

Greater range and volume with fewer tubes than ever before are attained through Erla Duo-Reflex circuits, using Erla synchronizing radio and audio transformers.

In Erla circuits, tubes do triple duty, as simultaneous amplifiers of received radio frequency, reflexed radio frequency, and reflexed audio frequency currents. Through accurate superimposition of currents identical in phase and frequency, by means of Erla synchronizing transformers, this triple function is flawlessly performed, resulting in tremendously magnified amplication without distortion.

Even one tube provides excellent loud speaker reception over a wide range; two tubes blanket the zone ordinarily covered by four; while three tubes bring in stations on the loud speaker from coast to coast.

Other notable improvements, contributing vitally to the superiority of Duo-Reflex circuits, are the Erla fixed crystal rectifier and Erla tested capacity condensers. Combining advanced characteristics for reflex work with unduplicated uniformity, they are indispensable to complete stability and purity of reproduction.

Detailed diagrams and descriptions of Erla Duo-Reflex circuits are presented in Erla Bulletin No. 16. Ask your dealer, or write, giving your dealer's name.

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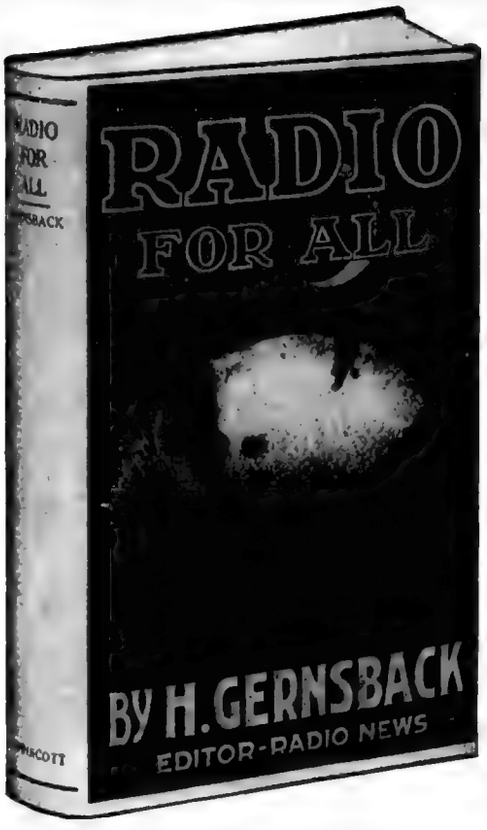


# RADIO FOR ALL

**By H. GERNSBACK**

Editor "Radio News," "Science and Invention" and "Practical Electrics"

*With over 130 illustrations and diagrams, and 12 photographs, 300 pages, size 8¼" x 5½".*

**What the novice in radio needs is a book in which he can get all the information necessary for him to understand radio telephony and telegraphy, to make or buy a receiving set suitable to his means, to know how to operate his set, and after he has an understanding of the radio art, information that will enable him to advance and get the most out of his outfit. All this must ordinarily be dug out of text-books, pamphlets and government publications, but the aim of this book is to have all the data and information that the beginner will need from the time that he takes up radio. It is a permanent, comprehensive reference book for the dyed-in-the-wool dabbler in Radio.**

## What the Book Is.

A combination of a radio course for the novice in radio telegraphy and telephony with a reference book for the more experienced amateur. Half a dozen books in one.

## For the Beginner.

The theory of radio carefully explained with drawings.
Description of and instruction for operating instruments of receiving and sending sets, with all picture diagrams of the wiring of the apparatus.
How to make your own receiving set, costing from $3.00 to $50.00.
How to read diagrams; for every picture diagram there is a corresponding technical diagram using the symbols instead of drawings.
How to tune sharply and eliminate interference from other stations.
How to protect your set from lightning and the laws regarding installation.
Explanation of time and weather signals.

## For the More Experienced Amateur.

How to make a practical vacuum tube detector, two stage amplifier set costing less than $50.00, that will work.
How the radio compass works.
All about underground aerials, loop aerials and directional aerials.
Formulae for finding wave length; miscellaneous formulae for finding capacity of condenser and other instruments. Tables of wire resistances, wave lengths and their corresponding frequencies, approximate wave lengths for different aerials, tuning coil data, and much more invaluable information.

## Special Features.

Lists of all the broadcasting stations in the United States and Canada for concerts, time signals, weather reports, press, stock market reports, etc., with their call, wave length and time of sending.
Detailed description of Washington weather signals and their translation.
Description of a modern broadcasting station and its operation.
Large map showing location of all U. S. radio telephone broadcasting stations suitable for hanging up in radio room.
Collection of miscellaneous radio information for the amateur.

## In Other Words.

The information that you ordinarily have to dig out of government publications, text-books, pamphlets, etc., is handily combined in this one book.

*The Complete Book of All Radio Information*

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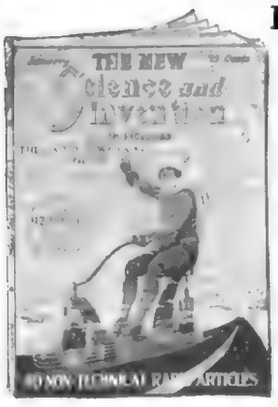
The New

# *Science and Invention*

## In Pictures

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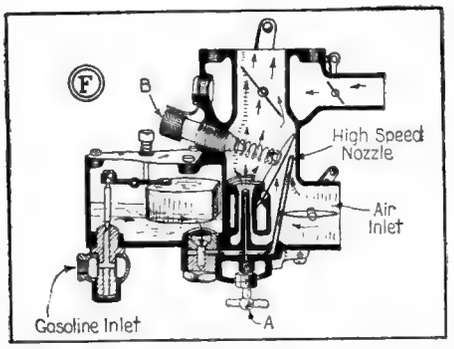
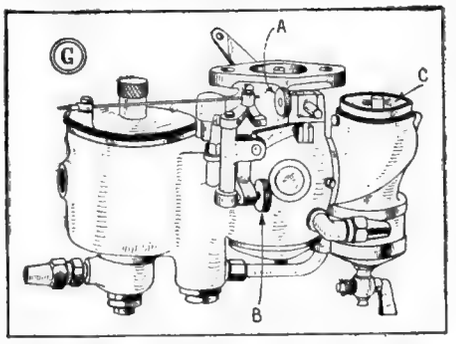
## Motor Hints

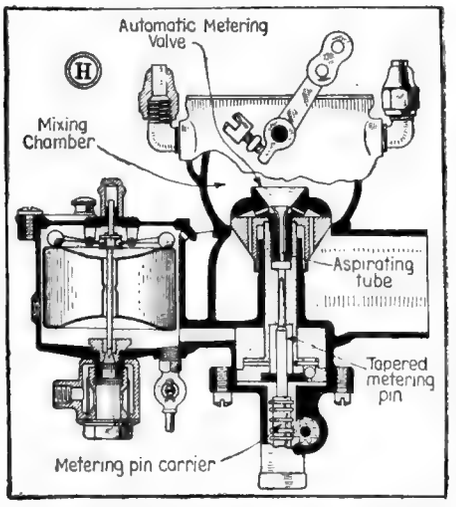
(*Continued from page* 1063)




The first adjustment to be made in the Marvel, shown above, is the low speed. After the engine has warmed up the gasoline adjustment "A" should be turned to the right until the engine slows down slightly and then turned to the left until the engine runs evenly. The spark lever should be on full retard position, and the throttle closed when making this adjustment. To make high speed adjustment advance the spark to about three-quarters way down. Open the throttle quickly, and if the engine spits back through the carburetor screw in the air adjustment "B" until the engine will respond quickly, when throttle is opened suddenly, without spitting back. If the engine chokes and does not respond quickly, screw out the air adjustment until the engine accelerates quickly.




The Rayfield Carburetor has a high and low speed adjustment, and also an easy gasoline level adjustment. In the side of the float chamber a small glass window will be found, and the gasoline level should be half way up the glass when correctly adjusted. Sketch "G" shows a Rayfield. For the other adjustment proceed as in the other cases.




By comparing sketch "H," the Stewart Carburetor, with the other illustrations the absence of needle valves and adjustments will be noticed. The operation of this type of carburetor is very interesting. The flow of gasoline into the float bowl is controlled in the usual way, but the operation of the carburetor is very different. When the suction comes there is a vacuum formed in the mixing chamber which causes the metering valve to lift from its seat and air is admitted in exactly the right proportion to the gasoline which is drawn up through the aspirating tube. There is only one adjustment which raises or lowers the tapered metering pin, and thereby increases or decreases the amount of gasoline supplied through the aspirating tube. This adjustment can be operated from the dash board at the will of the operator.


# —and Now a Complete Radio Receiving Set

Consisting of

**Radiogem Phone and Aerial** **$2.50**

Shipping Charges Prepaid to Any Point in the U. S.

This outfit is absolutely complete. It includes everything you need to hear the Broadcast Programs, market reports, time signals, ship calls or land station messages. Nothing more to buy—no batteries or tubes needed—no upkeep cost of any kind.

$2.50 Complete

$1.00 Without Phone or Aerial

(Patents Pending)

## The Complete Outfit Consists of Three Parts

(One)

## The RADIOGEM

The simplest radio outfit made—yet as practical as the most expensive. A crystal receiving set that you can operate and enjoy even though you know absolutely nothing about radio. You receive the RADIOGEM unassembled, together with a clearly written instruction book, which shows you how to quickly and easily construct the set, using only your hands and a scissors. The outfit comprises all the necessary wire, contact points, detector mineral, tube on which to wind the coil, etc., etc. The instruction book explains simply and completely the principles of radio and its graphic illustrations make the assembling of the RADIOGEM real fun.

(Two)

## The GEMPHONE

An adjustable, 1,000-ohm phone complete with 3-ft. cord—the first inexpensive adjustable receiver made. The Gemphone is of standard type and made of the very best grade of materials throughout. The case is made of turned wood, an exclusive feature with the "GEMPHONE." This is responsible for its exceptionally rich, and mellow tone. Like RADIOGEM, the GEMPHONE is sold unassembled. Our Instruction pamphlet shows how to assemble it in two minutes, using only a screw driver.

(Three)

## The AERIAL OUTFIT

Consisting of 100 ft. of standard copper aerial wire and two porcelain insulators.

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|---|---|
| Complete Radiogem Outfit | $ 2.50 |
| The Radiogem, only | 1.00 |
| The Gemphone, only | 1.00 |
| Aerial Outfit, only | .50 |

### What They Say About RADIOGEM

I am enclosing herewith $1.00 to pay for the Radiogem. I had it carefully wound by our wireless operator and find that it works beautifully—fully as good as any crystal set we know of.

Radiogem received, which we assembled and were very much astonished at results obtained and the clearness and volume of tone produced.

The greatest distance I heard on one of your sets is 1000 miles, having heard WGY at Schenectady, N. Y. I think your set is the best I have ever sold at any price.

Herewith P.O.M.O. amt. $1.00 for another "RADIOGEM." The one received is O.K. Placed about 15 ft. of picture cord under front porch and grounded to a gas meter, and heard the Sacramento Bee and Sacramento Broadcasting Union much better than with my large crystal set.

Your RADIOGEM RECEIVER is a wonder. I have received every station in Philadelphia with it much louder than with a high-priced crystal set.

Your two Radiogem sets received last night, and one was wired up for testing. WOC is about 40 miles away, and their signals could be heard with headphones on table. After they quit KYW at Chicago about 170 miles east was heard. Every word could be plainly heard here.

You claim a radius of 20 miles over your "Radiogem" is sometimes a possibility. You should adhere to the truth. I constructed one for my mother, installed it with an aerial, and she listens not once in a while, but at her will, to Schenectady, Newark, New York, or Providence, R. I., and her home is Attleboro, Mass. I can't give your set too much praise.

(Names and Addresses on Request)

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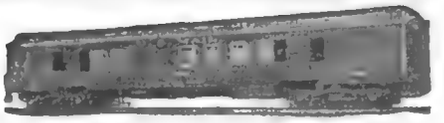

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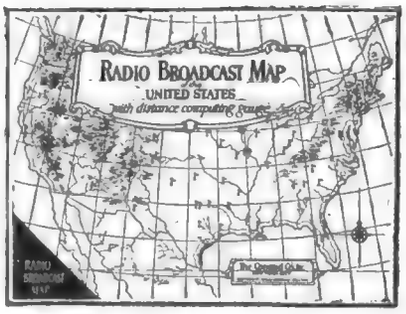
# Get the Consrad *Cloth* Radio Map of the U. S.




The Consrad Radio Map is different from all other maps in that it is printed on CLOTH and with proper care will last a lifetime.

The Map measures 17x22" and contains a special distance computing gauge of our own design which enables one to find any broad-casting station at a moment's glance.

A measuring rule is also furnished to help find the distance from any point in the United States to the station which is being received.

The broad-casting stations are contained on a separate sheet which can be fastened to the map by ordinary paper fasteners. The list is up to date and contains the new wave lengths.

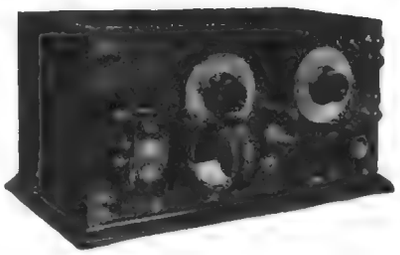
The map is furnished in two colors and with the sheet of broad-casting stations, is enclosed in a two color heavy manilla envelope 9½x12".

# Consrad Pattern No. 9. How to Make the ST100 Receiver

The S. T. 100 receiver employing a circuit devised by John Scott-Taggart of London, has proven to be one of the most efficient sets of reflex variety for broad-casting reception.

While only two tubes, a crystal detector are used, the energy amplified of incoming signals is powerful enough to operate any type of loud speaker without additional amplification.

The quality of reception will astonish those who are familiar with the performance of other circuits.



Another important feature is that the set tunes sharply, which is one of the utmost requisites of an ideal receiver.

The packet consists of blue prints for drilling the panel, wiring the apparatus, and a four-page instruction pamphlet giving complete details as to the parts required, tools needed, and even how to tune.

All these are contained in a two color heavy manilla envelope, 9½x12". **50c.**

**$1.25** **Here is Your Chance to Learn All You Can About *RADIO***
**The $10.00 "Radio Reading Course" Special at** **$1.25**

All the technical details and a thorough explanation of radio reception, written in easily understood, non-technical language by a foremost radio engineer and inventor. The five Lecture Books with over 100 graphic drawings give you the knowledge to intelligently buy, design, build, operate and maintain radio receiving apparatus. Tells you how to locate and correct troubles, how to make your apparatus more efficient and gives you a **thorough knowledge** of radio science. This set of five handsome Lecture Books are a complete radio library. To own them is like having a trained engineer or instructor at your side, answering questions, pointing the way. No matter what your interest in radio, take advantage of this attractive special offer and be the owner of this fine set of books.

**This set can be gotten at your dealers or direct from us on receipt of $1.25. If you prefer we will send it C.O.D. and you can pay the postman on receipt.**

The Consrad "Making Your Own" series consists of plans for the construction of the most popular radio circuits and are gotten up so that anyone can construct a receiving set as easily as a woman can sew the simplest dress. Blue prints are furnished for drilling the panels and wiring the parts and a four-page pamphlet contains complete instruction even as to tuning. Each pattern is contained in a two colored heavy manilla envelope 9½x12" and sells at ..... **50c.**

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| 7 | How to Make a Neutrodyne Receiver | 50c |
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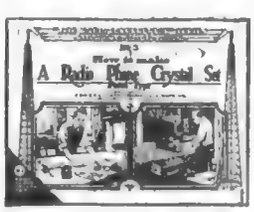

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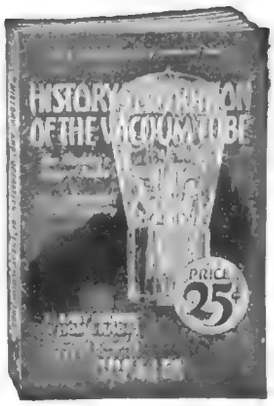



## History and Operation of the Vacuum Tube

*By* PROF. J. H. MORECROFT
Associate Professor of Electrical Engineering, Columbia University

*Edited and Approved by*
MAJOR GENERAL GEO. O. SQUIER, Chief of the Signal Corps, U. S. A.

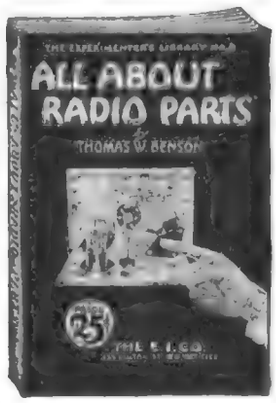
This book serves an interesting study of the fundamental principles, historical evolution, and practical application of the vacuum tube as used in radio apparatus of every description. Since the vacuum tube is one of the most important parts in the modern radio set, and has been largely responsible for making present-day radio entertainment possible, this book has been entirely devoted to the subject of that one particular instrument. It is written in simple everyday language with all technical terms thoroughly explained so as to make matters easily understood by everyone.

The book contains chapters on the phenomena of vacuum tubes in general; the operation of vacuum tubes as detectors and amplifiers; and the junction of the vacuum tube used in various transmitting and receiving circuits, etc., etc.

52 pages printed in legible type; 24 illustrations and diagrams; bound in two-color cover; size 5½ x 7½ inches; **Price, 25c.**

## All About Radio Parts

*By* THOMAS W. BENSON




This book gives an extensive description of the various parts used in all types of receivers, especially explaining the features of certain apparatus and circuits. It also describes why the different parts are used and how they operate. There has been nothing overlooked.

To begin with, the book tells how radio waves are collected by means of an aerial, giving details of construction of different types and their advantages. Then detection is explained and various types of crystal and vacuum tube detectors described. Amplification, including regeneration, radio and audio frequency, is simply told.

This very instructive book will prove to be of great value in the hands of anyone interested in radio as it is very explicit and thorough.

Contains 52 pages, 36 illustrations and diagrams; bound in a two-color cover—size 5½ x 7½ inches. **Price, 25c.**

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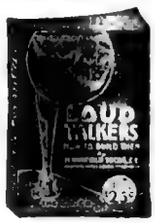


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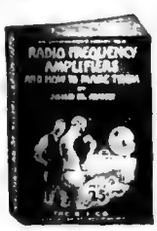


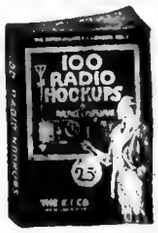


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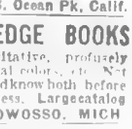


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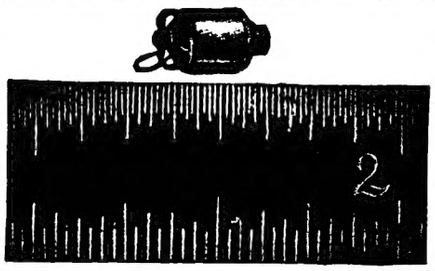
# $200 Miniature Electric Prize Contest

THIS prize contest conducted by PRACTICAL ELECTRICS magazine, promises to be one of the most interesting that has been staged in recent years.

Here at last is something worth while. Not only can you win an attractive prize, but you will derive a tremendous amount of personal satisfaction from this contest. The illustration on this page shows the smallest electrical motor that has been built. Its dimensions are as follows: 11/64" high; 19/64" long. It weighs 5.5 grains.

This little motor is along the lines of our new contest except that we will not be quite so hard on the participants. *We require miniature electric models, the largest dimensions of which must not be more than ¼".* Any electrical appliance, any electrical apparatus, any radio instrument that will be reproduced *in a working condition* in miniature, is eligible for entry in this contest.

**World's Smallest Electric Motor**



Total weight slightly above 5 grains. The tiny armature, .09" in diameter, has 4 pole pieces and is wound with No. 40 silk copper wire. Silver brushes are used. The over-all dimensions of the motor measure 19-64" long and 11-64" high. When connected to a small flash light battery, the motor runs at a very high speed.

## $200 IN GOLD

| | |
|---|---|
| First Prize | $75 |
| Second Prize | 50 |
| Third Prize | 20 |
| Fourth Prize | 20 |
| Fifth Prize | 10 |
| Sixth Prize | 10 |
| Seventh Prize | 5 |
| Eighth Prize | 5 |
| Ninth Prize | 5 |

The judges will welcome miniature models of the following: Electric bells, switches, all kinds of electric heating appliances, electric generators, telephones, microphones, telephone desk stands, telegraph instruments, any and all radio apparatus, static machines, electric lamps, batteries, rheostats, measuring instruments, fans, transformers, in fact any electrical apparatus or electrical appliance. *One of the rules of the contest is that the miniature models must work.* Dummies cannot be entered in this contest. The builders of these miniature models will come in for a goodly share of publicity as many newspapers and periodicals will feature these models.

All particulars for entering the miniature models in this contest, closing date, rules and restrictions, etc., will be found in full in the February issue of PRACTICAL ELECTRICS.


The Electrical Magazine for Everybody
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One-third More Text and Reading Matter than Heretofore

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PRACTICAL ELECTRICS is probably the most novel magazine of its kind ever conceived. It is personally edited by H. Gernsback, editor of SCIENCE & INVENTION and RADIO NEWS. Mr. Gernsback, who founded the old "Modern Electrics" as well as the "Electrical Experimenter," knows thoroughly what his readers want and have wanted for many years. PRACTICAL ELECTRICS, the 100% electrical magazine eclipses the best that was in "Modern Electrics" and "Electrical Experimenter."

Electricity covers such a tremendous field that the man who does not keep abreast with it does himself a great injustice. PRACTICAL ELECTRICS covers that field from every angle. It is written in plain every-day language that all can understand. It portrays the entire electrical development of the month faithfully in non-technical language. It caters to everyone interested in electricity, be he a layman, an experimenter, an electrician or an engineer—each will find in this magazine a department for himself and plenty more.

The February issue now on the news-stands contains 64 pages, over 100 different articles and over 150 illustrations, with an artistic cover in three colors. Professor T. O'Conor Sloane, Ph.D., is associate editor of the magazine.

INTERESTING ARTICLES IN FEBRUARY "PRACTICAL ELECTRICS"

The Radiotron: A Vacuum Tube
By B. S. Havens of General Electric Company
Simple Oscillograph ..... By Carter Fiske
Electric Animals
Tidal Electric Power ..... By Albert Stachle
Voltage Finder
Electrical Destruction of Atoms
By Professor Rogers D. Rusk
Electric Camera Shutter ..... By A. Kiedis, Jr.
Carbon Contact Rheostat
Geertz-Beck Arc Lamp
Analogies and Others ..... By T. O'Coner Sloane, Ph.D.

**PRIZES**

This magazine offers a number of prizes, as follows:
Our $50.00 Prize Contest for Junior Electricians and Electrical Experimenters includes as its elements simplicity, as great a degree of novelty as possible, and practicability.
A new contest offering $200 in prizes for best miniature working models of electrical apparatus.
Also a new prize contest giving four prizes amounting to $37.50 for the best account of an odd electrical experience.
$3.00 for the best article on Elec-Tricks, the new department.
$3.00 for the best "short-circuit," the semi-humorous department.
In addition to this, the magazine pays high prices for all electrical experiments, electrical articles, etc. See current issue for full details.

This issue also contains articles by some of the greatest electrical writers, workers and students. The magazine will prove a revelation to any one interested in electricity.

Every issue besides its many other features contains the following departments:

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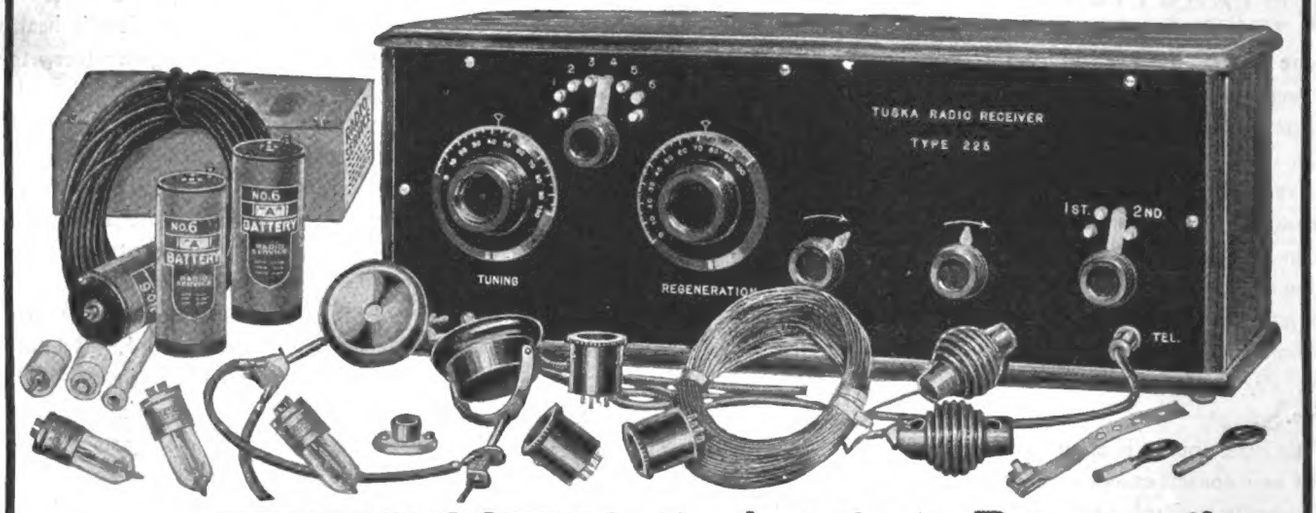


**This Famous TUSKA Armstrong Regenerative Receiver and Two-Step Amplifier, Complete**

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The radio outfits we sell are absolutely complete. Most others make an offer on the bare set and leave you to buy all the extras like tubes, phones, etc., in addition. The outfit we offer you includes the Regenerative Receiver and 2-step Amplifier all enclosed in a solid mahogany case. Also the batteries, head-phones, tubes, aerial, lightning arrester, and full wiring installation equipment. You start operating without investing another single penny. Your $5 payment brings it all.

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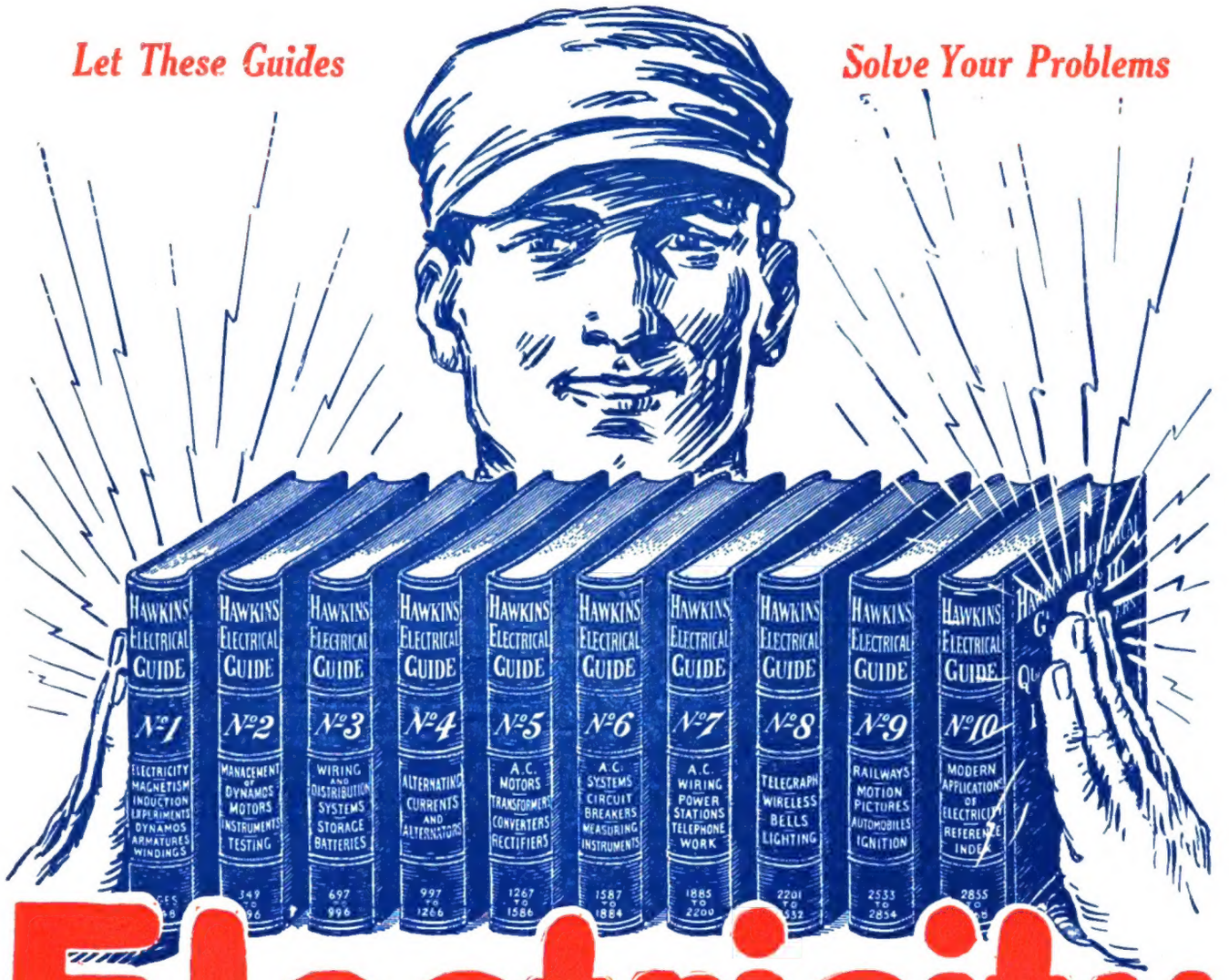


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RADIO has jumped into the front rank of the world's great industries. In its colossal growth it has swept across the face of the earth. The shores of every continent are dotted with Radio stations. Nearly every vessel on the seven seas is a floating Radio station. Thousands of factories are busy day and night supplying the tremendous demand for equipment and apparatus. Every night millions of people "listen in" to Radio broadcast news, music, entertainment and education.

### See the World as an Officer

Radio operators on swift ocean greyhounds are traveling the world over, visiting famous scenes, enjoying a wonderful life of romance and adventure—and at the same time getting a splendid salary. At land and broadcasting stations, operators, aids, specialists are doing this new and interesting work—and making big money doing it. Under their fingers flows the story of the world's progress. To them comes news from far-off countries speeding through the skies. Factories, stores, laboratories, banks, cities, business houses, newspapers and schools are employing Certified Radio-tricians as operators, maintenance, repair and installation experts, engineers, technicians, aids, designers, demonstrators, salesmen, instructors.

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This is a brief list of the positions in the Radio field today, and the salaries paid:

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- Commercial Land Station Operator, $150 a month and up.
- First-Class Ship Operator, $105 a month in addition to all expenses paid.
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- Radio Inspector, $1800 to $4500 a year.
- Radio Salesman, $2000 to $10,000 a year.
- Radio Mechanic, $1500 to $4000 a year.
- Radio Instructor, $150 to $250 a month.
- Radio Draftsman, $7 to $15 per day.
- Radio Executive, up to $10,000 a year.

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Yet Radio is only in its infancy. Despite the marvelous advances of the last few years we are only on the threshold of the Radio era. We have barely scratched the surface of its vast possibilities. We have merely guessed its yet undiscovered wonders! Great as Radio is today it will be a thousand times greater tomorrow! The man who gets into Radio today—who prepares NOW to grow up with this wonderful new science—will have a great share in its glorious future. He will be able to win fame, honor and wealth in this fascinating profession.

### How You Can Qualify at Home for a Fine Radio Position

For the ambitious man, Radio offers greater opportunities for success than any other profession or trade. No matter what your condition, no matter what your education or your ability, there is a special field in Radio where your natural talents will bring you a wonderful position, doing easy, interesting work at a fine salary; where your success is almost certain.

The National Radio Institute, known the world over as the oldest and largest Radio Training Organization, will prepare you quickly in your spare time at home to qualify for the position you want. Hundreds of our graduates are today reaping big returns from their instruction. Some of them are radio inspectors and engineers. Others are in charge of land and sea stations. Still others are in charge of radio departments in stores or are in business for themselves. But no matter in what special field they have gone, all of them are earning more money than they ever made before.

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Most of our graduates when they started our course, knew little or nothing about Radio. Yet, in a very short time, our instruction qualified them to earn big money as Certified Radio-tricians. The same instruction, the same help that brought quick success to these men, is now offered to you. You have the same opportunities, you have the same prospect they had. Take advantage of them.

In the panel on the left are just a few of the positions open to the Certified Radio-trician. Thousands of splendid big-paying positions are going begging for want of men able to handle them. Get into Radio *Now*. Grow up with it. Advance with it.

### Special Opportunity Now Open

The urgent need for radio experts and the calls which come to us for our students prompt us to make a special offer open to new students for a limited time. Through this special offer your enrollment will be accepted at a special rate, and you will receive, without extra cost, our new course in Wireless Telephony.

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